INDIAN FOOD INDUSTRY

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5/1996
SEPTEMBER/
OCTOBER

A PUBLICATION OF ASSOCIATION OF FOOD SCIENTISTS AND TECHNOLOGISTS (INDIA)

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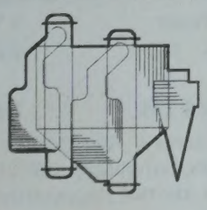

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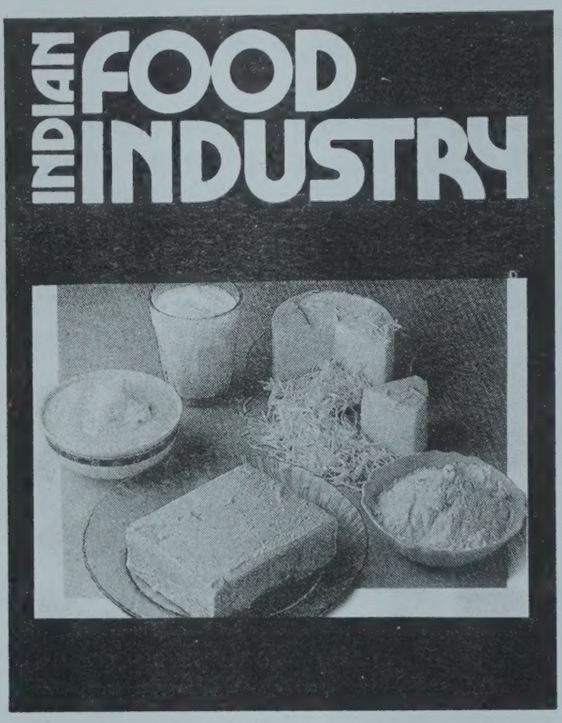

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Review articles, technology papers based on R&D work and reports on various aspects concerning food industry are welcome from food scientists and technologists from industry, research institutions and other related organisations. Contributors are advised to provide good quality illustrations in the form of charts and photographs along with the manuscripts. The Editorial Board reserves the right to edit the manuscripts in order to make them suitable for publication in the journal.

Food industries may send information (suitably illustrated with photographs) about their new products, machinery, business ventures and other developments, which will be published on the discretion of the Editorial Board.

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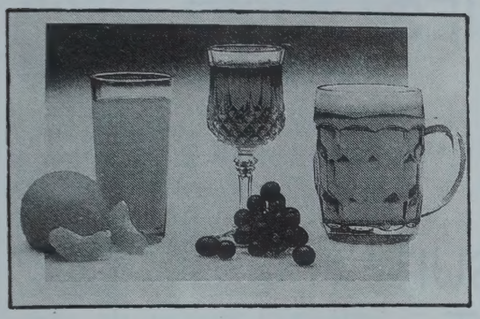

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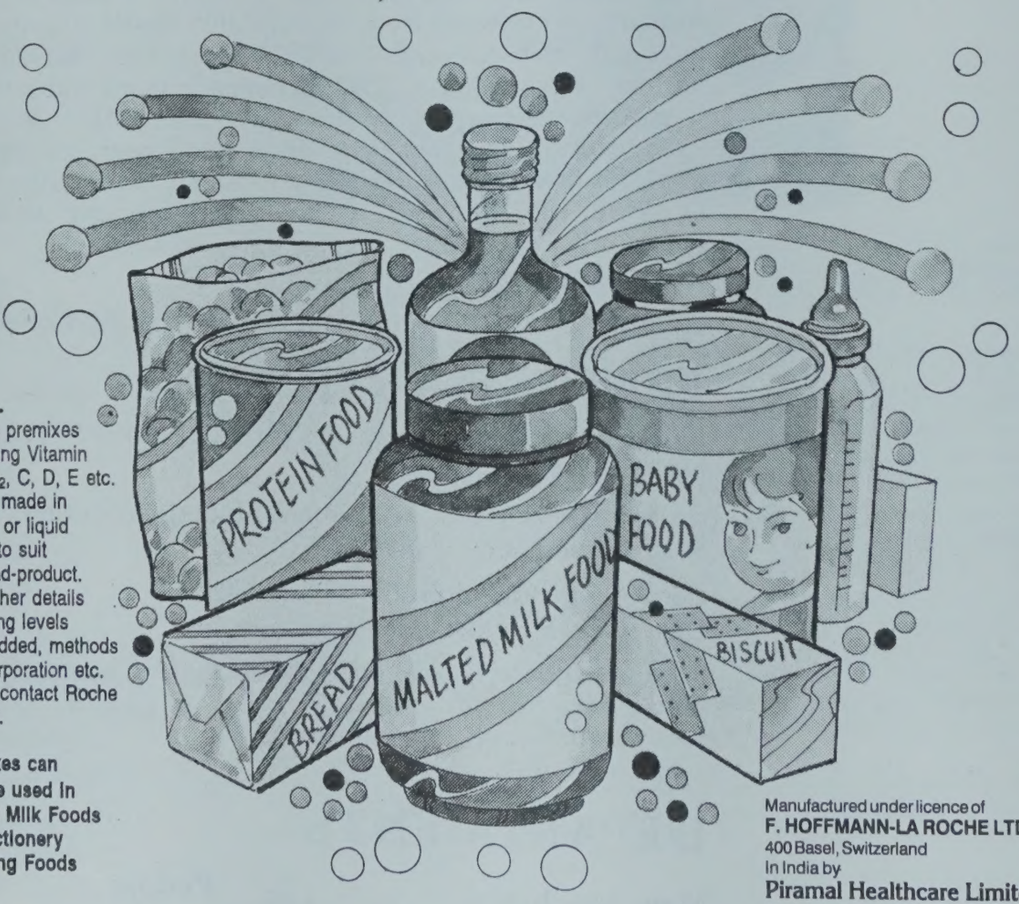

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INDUSTRY NEWS

Godrej Foods Posts Profit of Rs 14.2 Crore

Godrej Foods has recorded a net profit of Rs 14.2 crore for the year ended March, 1996 as against Rs 5.5 crore recorded in the previous year. Turnover recorded for 1995-96 is Rs 200 crore, an increase from the previous year's figure of Rs 150 crore. The company has declared a maiden dividend of 20%.

Most of the company's products recorded an increase in sales (quantitative terms). Jumpi'n sales went up by 32%, tomato puree sales by 22%, and edible oils by 31%.

Godrej Foods will be transferring its sale and distribution network to Godrej Pillsbury Ltd, a joint venture company between Godrej Foods and Selviac Nederland (a subsidiary of the $12 billion-Grand Metropolitan of UK). Upon transfer, the company will receive a consideration of $4.25 million from Godrej Pillsbury.

Cadbury to Invest $15 Million in Indian Operations

Cadbury Schweppes proposes to invest $15 million in India in the next three years in order to strengthen its bottling operations, infrastructure and to set up a new concentrate manufacturing plant, according to Mr Ashok Jain, the CEO of Cadbury Schweppes. The company is planning to set up a concentrate manufacturing plant in Maharashtra. It has developed bottles and crates and a lot of merchandising items for its products in the Indian market and export. The company also plans to export ginger root for Cadbury's ginger ale, quinine for its tonic water and other bitter drinks, fruit juices and other fruit material as well as value-added food products and related plant and machinery.

Changes in Policy Hamper Wheat Exports

In a sudden shift of policy, the Food Ministry has clamped down on wheat exports. The first announcement in this regard was made recently, when the ceiling on wheat exports during 1996-97 was lowered to 10 lakh tonnes from 25 lakh tonnes. Free exports of wheat products, consisting mainly of flour, *maida*, *suji* and wheat bran, was stopped from October 1, 1996. Exports are now subjected to a ceiling of 1.50 lakh tonnes for the six-month period of October 1996 to March 1997. The Food Ministry seems to say that exports have led to a shortage in the market, and retail prices of wheat and flour continue to rise, in spite of a substantial increase in the supply to the public distribution system. This type of thinking was correct in the month of June when there was a demand for Indian wheat due to a worldwide shortage. However, the market has vanished, and there are no takers for Indian-quality wheat in the world market now.

The about-turn in the export policy will have little impact on prices as the 1.5 million tonne reduction in the quota is only 2.3% in the current year's total wheat output of 64 million tonnes. Market sources say that poor procurement by the Food Corporation of India and state government agencies due to budgetary constraints are the key reasons behind the high price.

Agri-exports Infrastructure Near Bangalore Airport

Addressing an Indo-US agricultural biotechnology workshop recently in Bangalore, Mr C. Byre Gowda, Minister for Agriculture said that the Govt. of Karnataka will create infrastructure for agri-exports on 200 acres of land near the proposed Bangalore international airport at Devanahalli. The state government's new agricultural policy would facilitate the development of hi-tech agriculture through the entry of corporates. The state's farmers are receptive to new crops technology as could be seen by the fact that the cultivation of gherkins had taken off over the last few years in the southern part of Karnataka. Likewise, cultivation of grapes had spurted in the northern part of the state. The use of new technology could, also improve sericulture in Karnataka which accounted

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for about two-thirds percent of the country's production. A seven year programme for improving productivity in cardamom through tissue-culture technology had been very successful on 102.5 hectares of demonstration farms in Kerala, Karnataka and Tamil Nadu. There had been a 40 per cent increase in yield which, in per hectare terms, meant an additional revenue of Rs 20,000. The Spices Board is now planning to take up this programme on another 500 hectares. Tissue-culture technology is also being used for vanilla, large cardamoms and oil palms.

India May Become Largest Milk Producer by 2000 AD

India, which presently ranks second in milk production in the world with 63 million tonnes (MT) annually, next only to the USA, is likely to become the largest milk producing country by the year 2000. By then, India's milk production is estimated to touch 85.50 million tonnes.

Dr Maheshwar Mishra, President, Indian Society of Animal Production and Management, in his address at a symposium on livestock industry for self/gainful employment organized in the Tamil Nadu Veterinary & Animal Sciences University, Madras said that despite the upbeat mood in the offing in the milk production sector, the per capita consumption of milk in India was just 193 g, while that of egg was hardly 30 g. The contribution of the livestock sector to the GNP was as much as 25% of the output from agriculture and animal husbandry. India now stood sixth in the world for production of eggs, at 26,290 million eggs per year. 12th in poultry meat production at 365,000 tonnes along with mutton and chevon production of 0.153 million tonnes per annum.

The contribution of dairy with a 7 per cent real annual growth rate and poultry with a 11 per cent growth rate have been exceptional in the country in the past decade (1981-1991). While the growth of exports from the livestock sector at 13 % in real terms has been another major contribution to the performance of the Indian economy, as much as 22 % of the milk produced in the country was marketed and processed through the organized sector and the remaining 53 % through the traditional sector. Pork production in the country which reportedly stood at 361,000 tonnes (1991), had received very little 'development attention' though having considerable potential.

PM Assures Central Grants for Mobile Fruit Factory Scheme

The Prime Minister, Mr. H. D. Deve Gowda, has promised to extend full Central grants for taking up a scheme for setting up mobile fruit processing units in all districts in Karnataka on a pilot basis similar to the one in Bangalore. Karnataka Agro Industries Corporation (KAIC) plans to take the units to the doorsteps of farmers to process their produce.

Hafed Begins Commercial Purchase of Agri-produce for Local, Export Markets

The Haryana Agriculture Cooperative Marketing Federation (Hafed) has started commercial purchase of agriculture produce, including wheat, rice, cotton and oilseeds, both for the domestic market and for exports. Hafed distributed 1.17 lakh million tonnes of urea and other fertilizers through a network of primary cooperative marketing societies during the current season, besides a variety of insecticides produced in its own plant at Taraori.

Model Horticulture Project for Karnataka

A Rs. 66 crore integrated fruits and vegetables project, described as a model for the country, is on the cards to be taken up for implementation throughout Karnataka, according to the regional director for the National Cooperative Development Corporation (NCDC), Mr M Kuralnathan.

The project is to be implemented on a two-tier basis through the State Horticulture Federation at the apex level and the primary horticultural societies below. The project envisages direct grower-member linkages through the creation of infrastructural facilities for marketing, with need-based processing being taken up in the second phase. The project also

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has a novel proposal for setting up 10 exclusive fruit and vegetable super bazaars in the metros.

Patenting Encourages Disclosure of Inventions

The intellectual property rights (IPR) regime is important for recognition of the creative work of scientists, according to Mr Rodney W. Nichols, President and Chief Executive Officer of the 179-year-old New York Academy of Sciences and Chairman of the Executive of the Committee for Science and Technology in Developing Countries (COSTED). Though the extension of the concept of intellectual property to micro-organisms and biotechnology is new to India, Mr. Nichols believes that there is nothing that would particularly recommend exclusion of biotechnology from the IPR regime. One aspect of the IPR regime that, is not often talked about is the encouragement of public disclosure (through patent documents), so that other inventors and scientists do not waste their time in developing what had already been achieved. Scientists in the U.S. take IPR for granted as a constitutional guarantee and an economic incentive for both scientists and their employers.

Mr. Nichols, who fears a setback to international cooperation in science and technology because of the intensifying economic competition between nations, said cooperation was important particularly in areas such as AIDS and diseases of children. The New York Academy of Sciences has come with a report recommending improved mechanisms for global research collaboration in view of the "persistent fatigue" displayed by the systems established after World War II and the changes sweeping science and technology.

Mad Cow Disease Sees Ostrich Farming Taking off in Europe

Ostrich is raising its profile in Europe as beef farmers wake up to the demands of a health-conscious public and see the gawky bird as a potential solution to mad-cow depression.

Ostrich meat is red, but contains less fat and cholesterol than beef. Earlier this year, British Airways acknowledged its health benefits, adding the meat to its first-class menus on trans- Atlantic flights. "It is healthy and easy to prepare. The market in Europe is definitely growing. A few years ago, you hardly saw it anywhere, but it must be on the menu of at least a 10 restaurants in the Netherlands now," says Mr Van der Horst, Dy. Chairman of European Ostrich Association (EOA).

Quality Management - India Must Hurry up

During his lecture tour to India organized by the Institute of Quality Control (IQL), answering questions on how he thinks Indian companies are gearing up on the Quality front, Prof. Philip Crosby, a pioneer in quality movement, opined as follows :

"Not too badly. On the plus side, there is a lot more awareness about quality issues. Corporate chiefs now have a much broader view. They do not concentrate on the domestic market alone but have started thinking globally and, hence, feel the need to improve. But on the flip side, there is lack of urgency. Things like privatisation are happening, but the pace is too slow as compared to China, Korea or Taiwan, where markets are booming. In order to catch up. India must put its house in order, clear up internal problems such as political uncertainity and basically hurry up. Or she may just miss the bus.

Indian businesses have to realise that the culture of worldwide business is more important than national cultures. To meet the world's standard, they should leap right into quality.

Third World Farmers Affected by Patents

International effort is being mounted to prevent the rights of the farmers of developing countries to grow better crops in the name of intellectual property rights and patents. Rich private research institutions, many of them much larger and far better funded than the international institutions, are grabbing patents for products and processes invaluable to farmers of developing countries. Private institutions are claiming these rights under both national and international patent laws, framed by developed country governments and their lawyers

who knew how to safeguard the interests of the rich and did not care for the interests of the poor. In the annual meeting of of the Consultative Group on Intl. Agric. Res. (CGIAR) held recently, its Chairman observed that one can understand product patents but process patents could seriously hamper the work of research institutions, both national and international. He further opined that private institutions must be able to earn adequate funds for their work without hurting the farmers in the Third World Countries.

Food Summit Fails to Tackle Hunger

The World Food Summit which ended recently has left in its trail a wake of unanswered questions. The key issues addressed by experts the world over dealt with food production and food access for the millions of underprivileged people around the globe ? The question of increasing food production remains a tricky one especially with the global population expected to almost double within the next 25 years. Will food production be able to keep pace with this population explosion especially when, by present figures, 800 million people go hungry to sleep every night ?

Experts have warned that food production must increase by 75 per cent to keep up with this population rise. This does not seem likely under the current scenario with food production levels showing a steady decline. They have fallen from three per cent in the 1960s to 1.8 per cent in the mid-90s and even the Food and Agricultural Organization (FAO) admit there are little signs of their picking up before 2020. The reason for this is simply that developed countries do not want to produce more food as this would lower international prices thereby hurting their interests.

The burden of increasing food production will fall on developing nations many of whom are ill equipped to cope with this challenge. While some lack adequate infrastructural development, others like India, are seeing their agricultural base being eroded by increasing industrialization and the farmers' insistence on increasing their profit margins by growing cash crops.

India's country paper states, "despite spectacular increase in the foodgrain production in recent years, the problem of chronic malnutrition continues to exist extensively among children and women because they are caught in the relentless sequence of ignorance, poverty, inadequate food intake, disease and early death." It makes a mention of how wheat production has eaten steadily into the production of rice as a foodgrain. Whereas in 1950-51, wheat production comprised one-third of food production, by 1994-95 it has gone up to four-fifth figure. Pulses, considered the key source of proteins for the poor have registered a downward slide, with the per capita availability coming down from 69 g in 1961 to 37 g in 1995. The relentless increase in the price of pulses has made them out of reach for a sizeable section of the poor.

A recent nutrition survey conducted by the National Nutrition Monitoring Bureau of the ICMR drew attention to the alarming fact that 50 per cent of children living in rural India suffered from malnutrition while another 15 per cent suffered from severe under nourishment. These findings were disclosed in a seminar organized by FAO on Panchayati Raj as a precursor to the summit.

Spencer's Food World

A Value-based Supermarket of International Standards is coming up in Bangalore. Shopping in Spencer's will not be the same any more. Food World, a mega supermarket will replace the now familiar Spencer's department store on M.G. Road, Bangalore. "Food World is the new name for a new chain of supermarkets. Only the two existing Spencer's outlets in Madras and Bangalore will undergo the transformation," explained Vice President, Operations of Food World, S. Raghunandan. In other words, the name Spencer's will disappear from the Indian market. The change, will largely focus on value-added shopping on food market and home needs.

Global Pineapple Processor Plans Venture in India

The world's biggest pineapple processing company, the US -based Del Monte, has been having discussions with Indian companies for setting up a joint venture in India, according to Mr P.T. Raju, Chairman of the Southern Zone of the All India Food Preservers' Association (AIFPA).

According to Mr Raju, who is a member of the Institute of Food Technologists, Chicago, Del Monte's original proposal

was that the joint venture should cover not just the processing of pineapple but also its cultivation on 1,000 acres of land. However, in view of the difficulties for local companies to access that kind of acreage, the subsequent proposal was for contract-farming to cater to the needs of a processing unit with an input of about 500 tonnes a day. Mr. Raju estimated that the total project cost could be in the region of about Rs. 100 crores, with the local partner providing the land, building and balancing equipment, and Del Monte bringing in the sophisticated machinery.

Centre will Expand Technology Mission Programme on Oilseeds

Speaking at the 34th All India Convention of Oilseeds, Oil Trade and Industry recently at Bangalore, Prime Minister H.D. Deve Gowda said the Centre has decided to expand the technology mission programme on oilseeds during the Ninth Plan to further push up production and continue oilseeds in the priority sector.

The Centre would also strengthen marketing and post-harvest support systems to the sector and consider granting of liberal assistance on various production inputs.The processing industry should come forward in a big way to help farmers by providing marketing support specifically in case of soybean and sunflower which were being introduced in new and remote areas. He called upon the industry to modernize mills and install improved machinery to ensure higher recovery of oil as these efforts would go a long way in meeting the requirements of edible oils of the country's population and raw material requirements of the processing industry. He regretted that inspite of having a large area under oilseed cultivation, the country was not producing enough oil to meet the demand.

Water - A Scarce Resource

Though it covers almost three quarters of the globe, water is scarce on earth, especially safe water. A quarter of the world is dangerously short of water.

Though India is rich in fresh water resources, there are several hurdles in tapping it. Full use of the Himalayan rivers is not possible, storage is difficult in many rivers, most of the peninsular rivers pass through large areas of low rainfall, and above all faulty and irrational planning prevents proper utilisation of water. The population pressure further lowers per capita water availability now at around 3200 cubic metre.

The estimated annual requirement of fresh water for the years 2000 and 2025 are 750 and 1050 CKM respectively. The present quantity of usable water is just sufficient to meet the demand of the country by 2025 AD. The ultimate irrigation potential of India is 113 million hectare, of which only 68 million hectare has been exploited. But this is unevenly distributed, with Punjab, Haryana and western UP over-irrigated, and the peninsular regions and states like Bihar and Orissa under-irrigated. In these areas, farming is totally dependent upon rain water. These areas are also prone to flash-floods, thus people suffer both by draught and floods. For irrigation, only a small fraction of groundwater is being utilized. Up to year 2000, it is planned to use only 60 per cent of groundwater as compared to 73 per cent of usable surface water. Safe drinking water is not available in hundreds of villages. Only 78 per cent of urban population have access to water supply. Ironically, the targets for March '91 were to provide safe drinking water to every citizen.

Industries in India use only 3 per cent of the total water consumed as compared to 40 per cent in the USA. However, in metropolitan cities, the demand from this sector is about 12 per cent. Industrial requirement of water is much more than its consumption. India is the fourth largest country in the world in the number of large dams and reservoirs. Still almost every part of the country faces water scarcity.

Indian Food Industry is Projected to Grow Rapidly

India's food industry projected to be dominated by local companies, is expected to double in less than a decade. Value-added foods are predicted to show a threefold increase, according to one of the most comprehensive surveys of the food processing industry conducted by the Confederation of Indian Industry and McKinsey & Company.

The food industry , currently valued at Rs. 250,000 crore, is expected to have a multiplier effect of 2.3 which is higher than that of either power or telecom. This is similar to the status of the food industry in the United States which has a large food market and a higher

multiplier effect. The expanding industry will also push up agricultural yields which are today rather low even though India is the second largest producer of fruits and vegetables and the largest producer of milk. While backward linkages with the agricultural sector are projected to strengthen with emphasis on genetically engineered varieties, market inefficiencies are expected to be eliminated by integration across the chain with a few, large-scale players dominating each sector of the industry. The study predicts that this will be accompanied by the number of fast-food outlets swelling to over 2000 while over 1000 chain grocery stores will spring up representing a turnover of over Rs 10,000 crore.

The opportunities lie in the milk and dairy products, processed meat and poultry and packaged *atta*. The analysis shows that by 2005, milk and dairy products market size will be over Rs. 43,000 crore, processed meat and poultry about Rs. 40,000 crore and packaged *atta* about Rs. 15,000 crore.

Markets for products like frozen vegetables and snack foods are, however, not expected to grow much as predictions say that consumers will be more receptive to basic foods rather than subsistence or luxury foods. While the number of households buying subsistence foods is expected to grow only by about 14 %, those buying basic foods is predicted to double. More focus on quality and fair pricing is also expected since Indian consumers are found to be sensitive to both. At present, the food processing industry is said to be in a "nascent" state because of long-drawn clearance procedures, high production costs and tax rates, high wastage levels, infrastructural bottlenecks, inadequate supply and quality of raw material.

Nestle Patents Vegetable *Pulao* in India

After neem and *haldi* (turmeric), it is now the turn of the humble parboiled rice, vegetable *pulao* and rehydrated pulses in the global patent sweepstakes. Packaged food giant Nestle has applied for process patents in India on traditional items such as vegetable *pulao*, parboiled rice and cooked cereals. These are among the 17 items for which Nestle has sought Indian patents in the past one year. These applications are pending before the Indian Patent Office. In fact, top foreign and Indian companies and individuals have filed patent applications for 126 different methods to make some popular food items between October 95 and September 1996, according to an analysis of available data by the Department of Science and Technology (DST) Patent Facilitating Cell Director. Sixtyone per cent of these applications were filed by Indians.

The Indian Patents Act, 1970, does not allow product patents on food items and drugs. However, it allows grant of 5-7 year patents for methods or processes of manufacture of food items. Nestle, based in Switzerland, was granted a product patent on cereals with added vegetables (vegetable *pulao*, etc) on June 26, 1996, and on a process to prepare fast rehydrating pulses in May.

"It is shocking to know that such patent applications have been filed," said Forum for Biotechnology and Food Security President Devinder Sharma. "It only shows that the industries patenting system has become absurd for not taking into consideration key criteria such as non-obviousness." "These patents cannot stop our traditional food making processes, and so the impact will be minimal," said Indian Council of Agricultural Research Director-General R.S. Paroda. "We are yet to know whether the processes are based on new technologies, and only if the applicant convinces the patent office about it, will the patent be granted."

Tariff-cut on Edible Oil Imports Only Subsidizing Malaysian Farmers

The Union government's decision to reduce the customs duty on edible oil imports to 20 per cent from 30 per cent has amounted to subsidizing Malaysian farmers at the cost of Indian oilseeds growers. The price of Malaysian palmolein was $540 (C&F Indian ports) on the date of Budget announcement, which has gone up to $600 at present after the reduction in import duty. The price of imported palmolein in Mumbai was Rs. 28,500 a tonne on the day the Union Budget was presented in Parliament, and after an 8 per cent effective reduction in customs duty, the same prices were still prevailing. "Thus, Indian consumers had not benefited and the advantage had fully gone to Malaysian sellers," pointed out Mr G.G. Patel, President of the Solvent Extractors Association of India. However, he conceded that there was a supply-demand gap in edible oils and that there was a need for imports during the lean

season. He therefore suggested that the import of edible oils should be regulated through a higher tariff and allowed to the bare minimum needed to bridge the gap.

Surviving on Fat

Historically, there are good reasons why humans crave a fatty diet. We constantly remind ourselves that most of human history has been a battle to find fat, not avoid it. We note that the scrawny drivers of Mumbai and Calcutta used to put away thousands of calories a day and yet never gain an ounce. And it is not true that the Japanese, an ethnic group perpetually trotted by researchers as exemplars of sensible eating (they even call their parliament the Diet), spend fortunes to buy Matsusaka beef, which comes from Wagyu cattle that has been pampered and beef-fed to the point that the animals resemble mounds of fat with hooves, horn and contented expressions. It is no accident that fat adds taste to foods : evolution is reinforcing our urge to eat something that we need in order to survive.

McDonalds Plans India Debut Soon

American fast food giant McDonalds, whose entry into the Indian market has been the subject of speculation for the last two years, is now preparing to open its first two outlets in Delhi and Mumbai later this year. McDonalds, which got Foreign Investment Promotion Board clearance in 1991, has been extremely cautious in planning its Indian debut with company officials attributing the delay to the country's complex mechanism for awarding clearances to foreign projects, particularly in the consumer sector. "We are extremely bullish about the Indian market because it is probably one of the few markets in the world which has developed and ripened within no time," said Mr Vikram Bakshi, Managing Director of McDonalds India. He said McDonalds' planned India debut was faster compared to the time it took to launch its operations in Russia or China. Also this authenticates McDonalds' faith in the Indian market and the potential it offers. India, he said, though presently a very small market, will remain high on the McDonalds network in 92 countries given its large middle class with highly disposable incomes.

McDonalds has signed up with two local firms, the Connaught Plaza Restaurants in New Delhi and Hardcastle Restaurants Pvt Ltd in Mumbai to open its outlets in these cities first. The two firms have pumped in over $30 million into the initial operations, according to industry observers. "We will, however, concentrate more on the north Indian market because the awareness of quick service restaurant and the concept of convenience food is better developed in that part," Mr. Bakshi said. Confirming that the fast food chain had obtained the required permission at all levels, Mr Bakshi said depending on the success of the Delhi and Mumbai operations, more outlets could be in the offing. He, however, did not give any figures on the kind of investment Mcdonalds was planning for further expansion. He said although the Kentucky Fried Chicken episode had sent wrong signals everywhere, McDonalds operations in India would be appreciated because of its backward linkages rooted right down to the farmers. "We have spent all this time perfecting vendor development and coordinating with farmers. We have a commitment to source the products from local suppliers who will have an active say and will remain an integral part of our operational network," Mr Bakshi said. They will not serve beef, pork or their derivatives in their Indian menu. Their speciality will be mutton, fish and chicken burgers and also eggless sandwich sauces and vegetable nuggets. McDonalds had imported state-of-the-art equipment to support their infrastructural requirements with major emphasis on training of personnel at all levels. Presently, McDonalds India is training about 300 people in various managerial and operational skill before they actually go to work at the outlets. Hygiene will be an important aspect.

Over Exploitation Affecting Fish Industry

The United Nations Food and Agricultural Organization (FAO) has warned that fisheries are on the decline worldwide, with virtually every commercial fish species over-exploited, fully-exploited or depleted. Fish species are being taken from the seas faster than they can regenerate. In a quarter of the world's marine fishing regions, the catch has shrunk by more than 30 per cent, according to the Washington based World Watch Institute. However, says the Institute's Mr. Peter Weber, "Fishers could potentially increase their catch by 20 MT, or 25 per cent of the current catch, if they allowed fish populations to rebuild."

World Watch also estimates that more than 1,00,000 fish workers have lost their jobs in the last few years because of declining catches. Depleted resources have led to heavy competition and even to international skirmishes. Thousands of fishing villages along the coasts of India, Sri Lanka and Bangladesh, which have traditionally depended on the daily catch for food and cash income, are now sailing back to shore with their nets empty. In the last 30 years, uncontrolled trawl fishing for export and coastal pollution have severely depleted the fishing areas of the Arabian Sea, the Bay of Bengal and the South China Sea. In the Philippines, villagers use dynamite and cyanide squirts to be able to catch enough fish to survive from day to day. This destroys the coral reefs, making fish even more scarce. In addition to over-fishing, pollution from the discharge of oil and chemical contaminants has had a huge toll on global marine fish populations. Coastal regions are particularly affected by pollution. Some 90 per cent of the world's fish catch comes from a third of oceans near the coasts. A quarter to a third of the world's catch is also discarded by fish workers as 'by kill,' endangering some species. Non-traditional fishing methods, including the use of satellites, sonar, high-intensity lights, and cyanide which is used to temporarily stun fish, are also endangering species. Nylon fishing nets- weighted down by chains and dragged along the seabed - also kill sea urchins, crustaceans, and starfish.

Fish and other sea products also supply 16 per cent of animal protein consumption globally. And, according to World Watch, one billion people in Asia rely on fish as a primary source of protein.

India's Slow Progress in the Production of Essential Oils

World demand for quality essential oils and their derivatives is seen increasing steadily, and natural products will continue to remain an important part of modern medicine. India grows a large number of medicinal and aromatic plants and is a key supplier to the global perfumery, cosmetic, flavour and pharmaceutical industries. However, unless the country sharpens its focus on quality, as well as cultivation and extraction technologies, it will be left grossly lagging behind rival producers.

In the last five years, India has exported essential oils of sandalwood, Japanese mint, peppermint, rose, davana, lemongrass and palmarosa as well as jasmine and tuberose concretes to the tune of about Rs. 162.474 crore. We are now able to export citronella oil as well. India is the leading producer and supplier of sandalwood oil. But, in the last two decades, except for Japanese mint oil and peppermint oil, India has not achieved any remarkable progress in the production of essential oils. As a matter of fact, some other Asian and South American countries have gained ground in oil output, like that of lemongrass and palmarosa. China has progressed well in this sector during the last two decades and emerged as a major supplier. Unless we develop a spirit of co-ordination, improve our age - old distillation technologies and varieties of aromatic plants for high oil content and yields and introduce economic agronomical practices, we will not be in a position to compete with others.

Collaboration between government research laboratories and industries is indeed very essential. Industries should come forward to sponsor research projects for such programmes. And, we should not concentrate solely on export-oriented projects but also take up projects involving import substitution.

Untapped Power Potential in Sugar and Paper Industries

Rapid urbanization and industrialization has resulted in severe power shortage. The state governments are trying to tap all possible resources to bridge the gap between demand and supply. Yet there have been no efforts towards cogeneration, through which the need for power could be minimized. It is wellkown that by installing high pressure boilers, electricity in excess of the factory's requirement can be generated and sold to the Electricity Boards or others. Sugar factories all over the world - Hawaii, Brazil, Mauritius, Reunion Island, Thailand - have such cogeneration facilities installed in their factories. Though the technology is commercially available, it is yet to catch up in India.

Over-dependence on the coal based power generation is creating problems like damage to environment, coal linkage difficulties, extensive requirement of transmission networks, long gestation periods and exhaustion of precious fossil resources. The country has a large untapped

potential of hydro power generation. However, many major projects have been bogged down due to their perceived impact on environment besides longer gestation periods of projects.

At present the country is facing severe power shortage and there could be 'power riots" if no concrete efforts are made to abridge the gap between demand and supply. The country has a capability to generate 8,000-10,000 MW of power from sugar industries, paper industries, cement plants and chemical units, where high pressure boilers are installed.

Indiana Dairy to Make Table Butter

Indiana Dairy Specialities Ltd, plans to manufacture table butter for the Bangalore market first and then the Hyderabad market,. The initial production would be about half-a-tonne a day which would gradually be increased to about three tonnes per day (tpd). Apart from Amul, the competition in Bangalore will be from the Karnataka Milk Federation's *Nandini* and in Hyderabad from *Vijaya*. The manufacture of butter could be undertaken at the company's existing composite dairy plants. The company has two such plants, one located near Bangalore and the other near Hyderabad. The company is currently manufacturing ghee at the rate of 1.5 tpd and is marketing the same in packs with spouts.

Silver-Coated Dishcloth Kills Bacteria

The Silver Clean is a cotton dishcloth from I-Tech Co that features silver coated fabric with anti-bacterial properties. The fabric accounts for 3% of the cloth. Ions emitted from the silver cloth kill bacteria but won't harm the skin. The cloth comes in two sizes : 34-by-34 cm and 56-by-29 cm.

Dabur Floats Company to Market Foodstuff

Dabur India Limited is setting up a wholly owned subsidiary to market its food products in the country. The new subsidiary, Dabur Foods Limited - which will commence operations early next year - will market the company's "Real" fruit juices, capsico as well as ethnic food products, such as cooking pastes and cooking sauces, which Dabur India proposes to manufacture in the future. Originally, the plan was to transfer its entire food products portfolio to its joint-venture with Osem. However, according to Mr Amit Burman, Director in the Dabur Osem joint-venture, Dabur has now decided to market its ethnic food products through Dabur Foods and would manufacture and market "Western" products including bakery products, extruded food and snack food through the joint-venture. Commercial operations will commence shortly. The subsidiary has been planned to increase its focus on the food sector as well as to have an exclusive marketing and distribution network for food products. In the beginning, Dabur Foods will market products manufactured by Dabur India but at a later stage it might commence production as well.

Dabur plans to launch its cooking pastes early next year and also proposes to introduce ethnic cooking sauces similar to Nestle's "Tonite" sauces some time next year. Other ethnic product, too are in the pipeline. Meanwhile, the Dabur Oseam joint-venture has entered into a third party manufacturing contract with Rishab Foods Ltd. The joint venture company will commence marketing of cream-filled snack food manufactured by Rishab, next month. This will be the first product to be introduced by the joint venture and later on, it may extend the manufacturing tie-up to other products such as corn puffs.

Vital Gluten : Production and Use

Current uses of wheat are :

Food	33%
Seed	4%
Feed	8%
Export	54%
Nonfood, gluten	1%

Gluten statistics

240 million pounds/year used in U.S. 8% produced is exported; 45% of that used is imported. Currently produced by the U.S. firms

Cost : *ca.* $0.635/lb.

Tariffs : import, 4-8%; export, 77%

continued

Wheat Utilization is Limited by :

- Lack of established markets for gluten beyond traditional food uses.
- Technology for gluten/starch separation.

Potential products from Wheat gluten

Application	Description
Films	Gluten-based packaging films and coatings can be excellent edible, renewable, and biodegradable air barriers with good mechanical properties.
Coatings	Gluten coatings may protect flavour and shelf-life of foods. Chemically modified gluten may have superior properties as paper coatings.
Polymers/resins	Modified gluten hydrolyzates give flexibility and elasticity to certain polymers and resins. Gluten, as well as starch, can be grafted into polymers.
Ink	Adding gluten to water-thinned inks can reduce drying of pen tips, while speeding drying on some surfaces.
Laundry detergents	Modified protein hydrolyzates may stabilize enzymes added to detergents to remove stains.
Cosmetics and hair care products	Gluten hydrolyzates act as moisturizers in cosmetics, and as foaming agents and conditioners in hair care products
Adhesives	Modified gluten hydrolyzates are useful in pressure sensitive adhesives.
Rubber products	Modified cereal flours can reinforce certain types of non-tyre rubber.
Milk replacers	Partially hydrolyzed wheat has much potential as a milk replacer in animal nutrition.
Functional food products	Acid or enzymatic hydrolysis of gluten can improve its emulsifying, foaming, and solubility properties for use in foods.

NEW
PRODUCTS

Launching of 'Yumkeenz' Snack Foods

Mr. Vikram Bajaj who launched Uncle Chips is now launching a range of snack foods to be called Yumkeenz. Nine years ago, Uncle Chips was the first potato chips to be launched in the organized sector and over the years became a runaway success. The size of the potato chips market is Rs 750 crore, of which the organized sector is Rs 50 crore and the other big competitor is Pepsico's Ruffles. Bajaj is also planning to expand the manufacturing facility and is setting up plants in the western region.

Talking Convenience

M/s. Darshana Speciality Foods Pvt Ltd, a Hyderabad-based new aspirant has launched Baaton Baaton Me, a brand of convenience foods targeted at urban working housewives and bachelors. First out under the label are *toor dal* and *kheer*. The idea came from developed markets of the West, where a wide variety of convenience foods are available. For more details, contact the firm in the above address.

Inorganic UF/MF Membranes for Application in Food Processing

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Introduction

A membrane is a barrier which is capable of redistributing components in a fluid stream through a driving force such as pressure difference, concentration or electrical potential. When a concentration or electrical potential gradient provides the necessary driving force, the separation process is called dialysis or electrodialysis. However, most of the membrane processes (RO, UF and MF) are based on applied pressure difference across the membrane. Depending on the size of membrane pores, the molecular sieving of component constituents take place under the influence of the applied pressure difference in the approx. range of 1 to 100 bars. Depending on the pore size on porous nature of membrane structure, the pressure driven processes are classified as Reverse Osmosis (RO), Ultrafiltration (UF) and Microfiltration (MF).

Reverse Osmosis membranes are non-porous membranes. Ultrafiltration and microfiltration membranes are defined as those having pore diameters in the ranges of 3-200 nm and 0.2-10 microns, respectively. The membranes may be made of organic (polymers) or inorganic (mineral or ceramic) material. The first semi- permeable synthetic membrane was made-up of cellulose acetate. These membranes appear to give best combination of flux and rejection properties mainly in desalination of sea/brackish water. However, these membranes are not suitable for food/dairy processing applications due to certain drawbacks such as limited operational ranges of pH (3-7) and temperature (35^{0}C) and inability to withstand hypochlorite solution (50 ppm). These are highly bio-degradable and susceptible to microbial attack. Hence, normal sanitization with heat or chlorine to control sanitary environment of process is not possible with these membranes.

A membrane is a barrier which is capable of redistributing components in a fluid stream through a driving force such as pressure difference, concentration or electrical potential.

For application in dairy/food processes, certain non-cellulosic membranes have been developed using a variety of synthetic materials such as nylon (polyamide), polysulphone, are polyvinyl chloride, polystyrene, etc. Some commercial polymeric membranes available in the market are given in Tables 1 and 2. Very recently, materials like zirconium oxide, thorium chloride, aluminium oxide, carbon have been used to make porous membrane for wide range of applications in food and biotechnological processes. These porous membranes are called inorganic or mineral ceramic membranes. In this article, these third generation inorganic membranes will be discussed.

Historical Developments

Thomas Graham as early as 1866 observed that metallic palladium can absorb a large amount of hydrogen. Since his observation, palladium hydride system, has been studied extensively. Palladium based inorganic membrane systems and technology have been reviewed

Table 1. Ultrafiltration Membranes available to the Dairy Industry

Geometry	Dia or Chemical width (mm)	Composition	Cut of Min. Mol. Wt.	Manufactured
Tubular	25	Cellulose acetate	15,000	Abocr, USA
Tubular	24	CA & Polyamide	10,000	Kalle, W.Germany
Tubular	17	-	7,000	Wafilin, England
Tubular	13	Cellulose derivative	22,000	PCI, England
Hollow Fibre	-	Modakry	50,000	Romicon, USA
Hollow Fibre	-	Polyamide	2,000	Kropp, W. Germany
Flat Plate	0.3-0.5	Polysulphone	20,000	DDS, Denmark
Flat Plate	2.5	Non-CA	18,000	Dorroliver, USA
Flat Plate	2	Acrylic copolymer and poly sulphone	15,000	Rhone poulene, France
Flat Plate	2	-do-	50,000	Aqua Chem, ISA
Spiral wound	0.8	Poly sulphone	1,000	Osmonica, USA
Spiral wound	0.8	Cellulose acetate	600	Ladish, USA

Table 2 Reverse Osmosis Membranes available to the Industry

Geometry	Dia. or Channel Width (mm)	Salt Retention (%)	Water Flux ($l/m^2/hr$)	Manufactured by
Tubular	25	90-98	38-19	Abcor, USA
Tubular	24	70-95	80-25	Kalle, W.Germany
Tubular	17	88-96	50-30	Wafilin, Holland
Tubular	13	89-98	45-20	Paterson Candy (PCI), England
Tubular	-	94-97	27-19	United Oil Product, USA
Flat Plate	0.3-0.5	90-95	75-98	Danish Sugar Corp., Denmark

Source : Glover *et al* (1978)

by Armor (1989) and Hsieh (1988). In addition to palladium and its alloys, other inorganic materials have been found to be permeable only to certain gases. For example, silver and dense (stabilized) zirconium are only selective to oxygen. These palladium based non-porous membranes have not been used to any significant degree in conventional separation applications, probably due to their low flux and high costs.

In addition to palladium, several inorganic materials have been investigated as precursors for porous membranes. Many of such materials are not commercialized yet. These include cordierite, mica, silica, silicon carbide, silicon nitride, tin oxide and titania. Some other materials intended for smaller pore size membranes have been prepared. Molecular sieve carbon membrane having pore diameter close to 0.5-1 nm have been made (Koresh and Sojfer, 1983). Zeolite membranes have been attempted by reacting sodium silicate with caustic directly on the surface of porous sintered alumina to form sol followed by hydrothermal treatment.

Two membranes casting materials which had emerged for potential industrial application have been porous alumina and porous zirconia mainly for gas diffusion in uranium isotope enrichment for nuclear uses. The detailed quantitative information on the characteristics of these membranes is scarce due to security classification. The development of these gas diffusion membranes occurred independently to each other in United States in 1940's and in France, in the 1950's. Later in 1970's, Union Carbide refined the technology of Oak Ridge National Laboratories, USA, for commercialization of dynamic zirconia membrane and started marketing first commercial membrane under the brand name of Ucarsep^{R} zirconia membrane for gas diffusion applications. In France, alumina membranes which were originally intended for gas diffusion had been further developed by Ceraver (now SCT, and Alcoa subsidiary) for commercial liquid filtration processes. Similarly, zirconia membranes developed in USA were further improved for liquid filtration processes by SFEC, France, with the technical backing of French Atomic Energy Commission. Now SFEC manufactures "Carbosep", the first mineral membranes commercially available.

Several inorganic materials have been investigated as precursors for porous membranes. Two membranes casting materials which had emerged for potential industrial application have been porous alumina and porous zirconia.

In India, there have been laboratory scale attempts to cast Alumina mineral membrane by the process of Anodic oxidation.

Apart from France, only a small number of countries such as USA, Japan and more recently Holland, have tried to develop entirely mineral membrane for liquid separation. In India, there have been laboratory scale attempts to cast Alumina mineral membrane by the process of Anodic oxidation. These efforts are continuing with Atomic Research Laboratories at Kalppakam, Tamilnadu. Some of these commercially available porous inorganic membranes are tabulated as Table 3.

Mineral Membrane Structure

The mineral/ceramic membrane is composed of one or several layers of porous ceramic with well-difined texture. In case of several layers, the layers with the finest porosity forms the free surface of membrane and performs the separation. These layers are bonded in a monolithic way to each other and to the support by very strong ceramic bonds obtained by sintering operations.

The thickness of the separative membrane layer represents a balance between the physical integrity requirements on one hand and low flow resistance on the other. Current commercial use show a membrane thickness as thin as approximately 5 μm., but generally in the 10-20 μm. range. The bulk support needs to be in the range of few millimeters for mechanical strength. The intermediate layers range from 10 to 50 μm. in thickness.

Commercially available 'Carbosep' membranes have sintered carbon as support material and layer of zirconia (zirconium oxide) as separating membrane. However, Ceraver has Aluminium oxide as both support material as well as separating layer. The typical characteristics of Carbosep membranes are given in Table-4.

Table 3 : Commercial Porous Inorganic Membranes

Manufacturer	Trade Name	Membrane Material	Support Material	Membrane pore Diameter	Geometry of Membrane element	Note
Alcoa/SCT	Membralox	Al_2O_3	Al_2O_3	4-100 nm	Monolith/tube	
		AL_2O_3	Al_2O_3	0.2-5 µm		
Norton	Ceraflo	Al_2O_3	Al_2O_3	0.2-1 µm	Monolith/tube	
NGK		Al_2O_3	Al_2O_3	0.2-5 µm	Monolith/tube	
DuPont	PRD-86	Al_2O_3 mullite, cordierite	None	0.06-1 µm	Tube	Tubes spirally wound to form a cylindrical unit
Alcan/Anotec	Anopore	Al_2O_3	Al_2O_3	20 nm	Plate	Made by anodic oxidation
		Al_2O_3	Al_2O_3	0.2m		
Gaston Country Dyeing Machine Co.	Ucarsep	ZrO_2	C	4 nm	Tube	Union Carbide technology
Rhone-Poulene/ SFEC		ZrO_2	C	4 nm	Tube	Modified Ucarsep technology
		ZrO_2	C	0.08-0.14 µm		
DuPont/ CARRE		ZrO_2	SS&C	4 nm- 0.1 µm	Tube	Dynamic membrane
TDK	Dynaceram	ZrO_2	Al_2O_3	10 nm	Tube	Dynamic membrane
Asahi Glass		Glass	None	8 nm-10 µm	Tube/plate	
Schott Glass		Glass	None	10 nm & 0.1 µm	Tube	
Fuji Filters		Glass	None	4-90 nm	Tube	
		Glass	None	0.25-1.2 µm		
PPG/Sep Tech		Glass	None	6-30 nm	Hollow fiber	
Corning		Glass Cordierite (mullite)	None	2.6 - 4.9 µm	Monolith	
Toyobo		Glass	None	20 nm	Tube	
Ceram Filters		SiC	None	0.15-8 µm	Tube	
Fairey	Strata-Pore	Ceramic	Ceramic	1-10 µm	Tube/Plate	
PTI Technologies		SS	None			
Mott		SS, Ni, Au, Ag, Pt, etc.	None	0.5 - 100 µm	Tube/Plate	
Pall		SS, Ni, etc	None	≥ 0.5 µm	Tube	
Poretics		Ag	None	0.2-5 µm	Plate	
Osmonics	Hytex	Ag	None	0.2-5 µm	Plate	
GET		Carbon	None	4 nm - 1 µm	Tube	

Source : Hsieh, H.P. (1991)

Module

The membrane elements/modules are manufactured in different shapes such as tube, multi-channel monolith, disk or plate. In the Carbosep modules, tubular membranes are assembled in parallel bundles in stainless steel housing. The diffusing area of these modules range from 0.02 to 5.73 m^2 (Table-5) . Another configuration may be multi-channel monolith as shown in Fig-1. The modules provide the highest available filtration area per unit volume of a membrane element/module. Presently such modules are marketed under the brand name of 'Ceraver'. The characteristics of such modules which are commercially available are given in Table-6.

In industrial applications, a membrane module might consist of more than a thousand tubes or many monoliths, each of which contains 19 channels or more. It is obvious that the monolithic form makes installation and maintenance of membrane elements much easier.

Presently, mineral/ceramic modules are not available in commonly available configuration such as 'hollow-fiber' and 'spiral-wound'. However, as the demand for inorganic membranes and the manufacturing technologies improve, in future, those high packing density elements may become a commercial reality.

Industrial Applications

Mineral/ceramic membranes have a wide range of applications in separation of gas and liquid phases in high temperature or corrosive environment of separation. Current commercial activities are mostly in the area of biotechnology including food processing (agri-foodstuffs) which demand high level of sanitation and clean environment. This is the reflection of the instabilities of organic membranes (Polymeric) for industrially important processes involving high temperature and other corrosive environments.

Alumina membranes, currently available commercially, having pore diameter greater from 0.1 mm are found to be thermally, chemically and mechanically most stable and durable. Although these are stable up to about 1000^0C, the modules are generally recommended below 140-150^0C for those applications where steam sterilization is required. (Gillot and Garcera, 1984). These temperature limitations are due to the common scaling and potting material presently used in modules. It is possible to backflush these membranes with hot water for regenerating the initial flux during cleaning cycle. These membranes can be steam-sterilized and also chemically cleaned with caustic soda followed by nitric acid and in the temperature range of 50-80^0C, very similar to CIP cleaning of a food processing plant.

Mineral/ceramic membranes have a wide range of applications in separation of gas and liquid phases in high temperature or corrosive environment.

Alumina membranes have been used in a variety of applications. Some of the typical application fields are :

i) Microfiltration of water for municipal supply; preparation of clean water for industrial uses, or treatment of reject water.

ii) Clarification and sterilization of beverage, wine, beer, fruit juice, etc.

iii) Sterilization of liquids in the pharmaceutical industry.

iv) Cell harvesting and sterilization in biotechnological applications.

v) Ultrafiltration of milk and whey.

vi) Filtration of viscous liquids including molten plastics.

vii) Down stream effluent treatment.

viii) Filtration in chemical and nuclear industry.

These applications are very diverse and only few typical cases are discussed here :

Ultrafiltration of whole or skimmed milk has been successfully performed on a microfiltration membrane with a pore diameter of 0.2 µm. (Bennasar *et al.* 1982) with a protein recovery higher than 98%. Using velocity of 5 m/s and a pressure of 3 to 5 bars, an average flux of 80 litres/hr m^2 was obtained at 50^0C when concentrating whole milk upto a factor of 5. Higher concentration can also be obtained if needed.

Sharma *et al.*, (1992) while studying the performance of ceraver ceramic microfiltration module (No. P-19-40) having 0.2 µm pore diameter at 50^0C obtained excellent data on Ultrafiltration of different type of milks up to CF=4 which are tabulated in Table 7. Goudedranche *et al.*, (1980) utilized mineral membrane for making semi-hard cheese such as French variety St.Paulin. They claimed to reach a protein content of 21% and T.S. content of 45% while ultrafiltering milk using mineral membrane. Such

Table 4 : Characteristics of Carbosep Membranes

CUT-OFF		
	M4 membrane	20,000 daltons
	M1 membrane	50,000 daltons
	M6 membrane	2,00,000 daltons
Water Flux (25^0C, 4 Bars)		180-600 $1/m^2.h$
Burst Pressure		60 bars
Operating Pressure		15 bars
Crush Strength		30 kgf/20 mm
Young Modulus		1000
Pressure		15 bars
pH		0 to 14
Temperature		
Membrane		300^0C
System		150^0C
Sterilization		
	Oxidant	YES
	Steam	YES

Source : Daniele and Rene (1985)

Table 5 : Carbosep Modules

Reference (number of tubes)	Diffusing Area m^2
S1	0.02
S7	0.16
S37	0.84
S 151	3.43
S 252	5.73

Source : Daniele and Rene (1985)

FIG. 1 : **PRINCIPLE OF THE MULTICHANNEL ELEMENT**

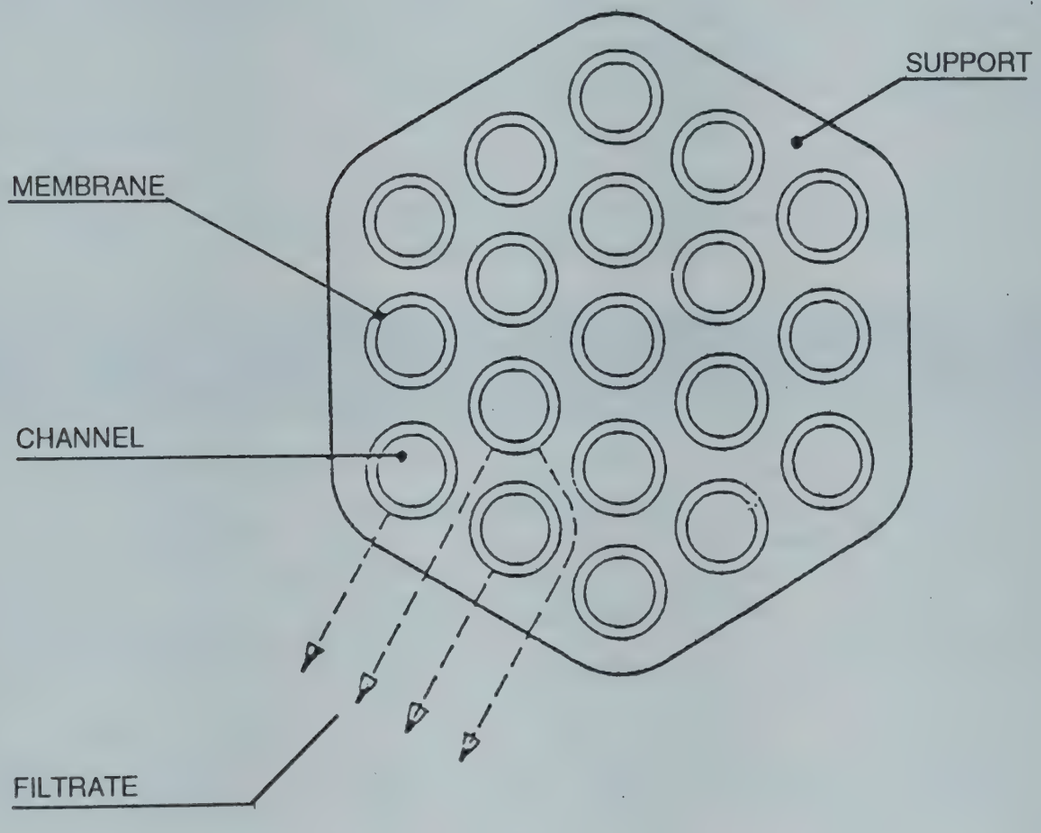

Table 6 : Ceraver Ceramic Modules

Characteristics of the Modules Filter Element	Number of filter elements	Length of the element (mm)	Module surface (m^2)
Multichannel	1	850	0.2
4 mm	7	850	1.4
	19	850	3.8
Multichannel	1	850	0.3
6 mm	3	850	0.9
	12	850	3.6
Tubes inner diameter			
7 mm	1	750	0.0165
15 mm	1	750	0.035

Maximum operating pressure : 8 bars or, upon request, 25 bars Steam sterilizable at 130^0C.

Source : Gillot *et al*(1984)

Table 7 : Mean flux, energy consumption and retention coefficients of different groups of skim milk (Creaver module)

Particulars of skim milk	Mean initial flux 1/h m^2	Mean flux CF=4 1/h m^2	Mean energy consumption to get CF=4 kWh/m^3 permeate	Retention coefficients at CF=4			
				TS[2]	P[3]	C[4]	L[5]
Pasteurized 72^0C/15 sec pH : 6.68	73.05	52.21	11.94	0.68	0.95	0.94	0.113
Severely Heated 95^0C/5 min pH : 6.68	109.89	73.63	8,23	0.722	0.995	0.945	0.093
Acidic 95^0C/5min pH : 6.0	106.82	69.47	8.93	0.750	0.982	0.633	0.089
Coagulated 95^0C/5 min pH : 4.6	165.40	86.13	7.12	0.729	0.979	0.194	0.117

Concentration factor ; [2] Total solids ; [3] Portein ; [4]Calcium ; [5]Lactose

Source : Sharma *et al*(1992)

high concentrations are not achievable by polymeric membrane yet. The average flux was 30 litres/hr m^2 for such high protein concentration. The membranes were easy to clean to regain initial flux.

Microfiltration of wine has the same typical features as a number of filtrations in food and beverage industry. With a pore diameter of 0.2 or 0.5 µm, very high limpidity and sterility are obtained with fluxes that vary with the type of wine, but generally are of the order of 100 litres/h m^2. One of the major advantages of cross-flow microfiltration of wine is that it replaces in one single operation the many steps of the classical direct filtration process (Poirier, *et al.*, 1984).

Sharma and Reuter (1991, 1992) standardized processes for production of *shrikhand* and *channa* using mineral ultrafiltration modules and obtained 23% and 19% extra yields of product over traditional processes, respectively.

In biotechnological applications, mineral membrane systems allow the coupling of a bioreactor or a biofermenter with ultrafiltration device. The UF-system forms an integral part of the fermenter when mineral membranes are used. This coupling offers the following main functions to the whole system :-

a) Joint sterilization of the fermenter and the UF-system.

b) Continuous, controlled elimination by the UF of metabolites.

c) Purification of biomass by continuous washing without exposure of air.

d) Concentration of biomass under sterile conditions continuously

e) Sterile drainage and recovery.

On the whole, bioreaction and biofermentation yields are boosted many-fold. Such coupled systems are operational for concentration of micro-organisms, the synthesis of amino acids and enzyme compounds, the extraction of biomolecules produced by fermentation, hydrolysis reaction of highly viscous complex media, etc.

The capacity to operate in totally sterile environment also endows these new membranes with potential applications, such as the preparation of thermally flagile biochemical solution by 'Cold' sterilization. The property is being utilized by the pharmaceutical industry.

These systems are best in the processes which demand high level of sanitation and continuous operation especially in biotechnology.

Typical Cleaning Procedure for Mineral Membranes

Cleaning by Backflushing

Backflushing is nothing but applying counter-pressure on filtrate or permeate side that pushes a controlled amount of filtrate back through the membrane thereby lifting the deposited matter on the membrane and indirectly cleaning the filtration area. The efficiency of this type of cleaning is dependent upon the type of suspension to be filtered and type of fouling that causes, and the frequency and amplitude of the pulses of reverse pressure. Short and frequent back pressure pulses, by constantly destroying this layer, maintain the filtrate flux at high value and enable a full exploitation of higher permeability of microfiltration membranes. This technique is one of the key advantages of ceramic/mineral membranes.

Cleaning by Chemicals

Membranes are composed of alumina. A typical cleaning sequence that gives good results in dairy or wine using filtration applications are as follows :

(i) Water rinse : 10 min. at $>15^0C$

(ii) Washing with 2 wt.% NaOH : 20 min. at 70^0C

(15 min. at ΔP=0.5 bar)

(5 min. at ΔP=1.0 bar)

(iii) Water rinse : 10 min, at $>15^0C$

(iv) Washing with 2 wt.% HNO_3 : 20 min.at 70^0C

(v) Water rinse : 10 min. at $>15^0C$.

(vi) Sanitization with hot water at 95^0C for min.or NaOC1 solution with 100 to 200 ppm. free chlorine : 10 min. at 20^0C.

Depending on the type of fouling, using the same cleaning fluids in a different order may give better results. The cleaning procedures are almost the same as adopted in CIP cleaning of food processing plant. The cleaning cycle does not demand special cleaning detergent or formulation as may be the case in polymeric membrane systems. It is easy and cheap to regain the initial flux in mineral membrane system after a well standardized cleaning cycle.

Conclusion

Historically, the mineral membranes were developed in France and USA for "Gas diffusion" in Uranium isotope enrichment for nuclear uses. However, due to the greater thermal, chemical and mechanical stability of these

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Cultured Milk Products as Infant Feeding Substitute

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Abstract

This paper focusses attention on the use of cultured milk products as a practical substitute for infant feeding. Appropriate technology for the manufacture of various cultured milk products, *viz.* yoghurt, acidophilus milk, bifidus milk, bulgarian milk, kefir, etc. have already been developed and recommended for infant feeding owing to their enhanced nutritional and therapeutic value. Some of these cultured milk products could be used as weaning foods and are more suitable for lactose-intolerant infants. Status of existing cultured milk products for use as infant foods has been explicated.

Introduction

Breast milk is considered superior for infants over other modified milk formulae owing to its various inherent properties and advantages (Jelliffe, 1975). However, breast milk is deficient in vitamins, iron and calcium (Barrie, 1976). A progressive decline in the incidence of breast feeding has been observe around the world (Kneebone, 1976). The main cause for mothers to stop breast feeding are lack of education, industrialization and urbanization, lack of sufficient production of breast milk, inconvenience and social status (Stanway, 1978; Misra, 1982). In the absence of nutritionally competent infant foods and inadequate production of breast milk, cultured milk products could be a suitable and practical substitute for infant feeding owing to its nutritional and therapeutic properties. A number of cultured milk products have been developed elsewhere and are recommended for infants. This article is a review on the cultured milk products recommended for infant feeding.

Various cultured milk products are recommended for infant feeding owing to their enhanced nutritional and therapeutic value.

Acidophilus Milk and Related Products

Acidophilus milk obtained from culturing milk with *Lactobacillus casei, Pediococcus acidilactis, Bifidobacterium* and *Propionobacterium shermanii* alongwith *L. acidophilus* were reported to be suitable for infant feeding (Lang, 1978). Cultured milk products containing *L. acidophilus* have already been developed in Czechoslovakia (Dedikova and Burdova, 1977) and in USSR (Solomadina, 1984) for infant feeding. Two modified *Acidophilus* milk products called Malyutka and Malysh have been developed for infant feeding by USSR Institute of Nutrition and the Dairy Industry Research Institute. The products had 95-96% digestibility. 87-88% protein utilization and contained $\geq 10^7$ *L. acidophilus* cells/ml (Sukhova *et al.*, 1979). Other *L. acidophilus* based cultured milk products developed for infant feeding are Baldyrgan (Sharmanov and Fedotov, 1979), Biolakt (Chokoeva *et al.*, 1980), Laktobakterin (Ladado, 1980), Pastolakt (Pyatkova *et al.*, 1981) Vitalakt (Nabukhotnyi *et al.*, 1985) and Khizh (Arutyunyan and Sagatelyan, 1987). These products were reported to be useful in the treatment of infants suffering from acute intestinal disorders, chronic disease of digestive systems (Ladado, 1980). Other advantages claimed by these products are reduced serum cholesterol (Harrison and Peat, 1974), increased biological value of protein components and increased readily assimilable forms of iron (Fateeva *et al.*, 1979). Thus *Acidophilus* milk

would be nutritionally and therapeutically suitable for infant feeding.

Bifidus Milk and Related Products

Higher incidence of *Bifidobacterium bifidum* in the digestive tract of breast fed infants and their antagonistic effect against pathogens have led to suggest their use as dietary supplement (Sandine *et al.*, 1972, Speck, 1976). Bifidobacteria based fermented milks *e.g.*, bioghurt and biogarde have been reported to have more than 90% L (+) lactic acid (Smaczny and Reinartz, 1982). Thus, the total intake of these products can be much higher than the suggested limits of yoghurt consumption. Other Bifidobacteria based cultured milk products developed for infant feeding are Biokys, Lacton B (Cerna, 1977), Vitalakt I, Vitalakt II, Vitalakt III (Shvedova, 1981), Lakton (Dolezalek, *et al.*, 1982), Biolakt (Chokoeva, *et al.*, 1980) and Culture (Hansen, 1985). These products are useful for reduction in toxic products in faeces (Taisho Pharmaceutical Co. Ltd., 1960), treatment of gastroduodenitis, peptic ulcer (Dorofeichuk *et al.*, 1983) and diarrhoea (Romond and Romond, 1990). Thus Bifidobacteria based cultured milk products could be a suitable substitute for infant feeding.

Yoghurt and Related Products

Yoghurt being capable of restoring the normal lactic intestinal flora and inhibiting undesirable proteolytic organisms has been recommended for infant nutrition (Deodhar, 1984). Besides normal yoghurt cultures, use of *Streptococcus lactis, Leuconostoc citrovorum, L. acidophilus* and *B. bifidum* has been reported to increase the nutritional and therapeutic status of the product (Roberts, 1977). Yoghurt-like products such as Biolakton (Ivanov *et al.*, 1971), *dahi* (Chandrasekaran *et al.*, 1975) and Bulgarian Yoghurt (Alekshieva *et al.*, 1980) have already been developed for infant feeding. These products prevent nosocomal infection (Ulcek and Kneiff, 1969), reduce the incidence of lactose - malabsorption (Satto and Castaneda, 1974), lactose - intolerance (Rao *et al.*, 1985) and cure subnormal acidity, hyperacidity, gastritis and ulcer (Oberman, 1985). Yoghurt could be used for infant feeding owing to its higher calcium content in protein and higher calcium/sodium ratio as compared to Recommended Dietary Allowance value for infants in USA (Demott, 1985).

Yoghurt being capable of restoring the normal lactic intestinal flora and inhibiting undesirable proteolytic organisms, has been recommended for infant nutrition. Yoghurt-like products such as Biolakton , *dahi* and Bulgarian Yoghurt have already been developed for infant feeding.

Bulgarian Milk and Related Products

As early as 1908, Metchnikoff reported that *Lactobacillus* inhibited the growth of putrefactive bacteria in the intestine and thus prevented the formation of toxic products responsible for various intestinal disorders. Bulgarian milk or related products developed for infant feeding are VITA, Humana and Bele-1. (Kochkova and Spasov, 1979) These products were claimed to have higher levels of amino acids (Stefanova, 1979), better weight gains, absorption and retention of nitrogen and fat without any digestive disorders and ability to cure enteric disorders. Stefanova (1979) also reported better persistence of *Lactobacillus delbrueckii subsp. bulgaricus* in infant's intestinal tract and antagonism against potential pathogens when fed with VITA. Thus Bulgarian milk or related products are nutritionally and therapeutically suitable for infant feeding.

Kefir

Manufacture of Kefir on an industrial scale for children from the age of 6 months has been reported by Ivanova *et al.*, (1980). Klyavinya (1980) reported two varieties of Kefir manufactured in USSR since 1979 for infant feeding. Kefir exhibited antibacterial activity against staphylococcal sepsis in infants aged below 1 year (Korneva *et al.*, 1979).

Other Cultured Products

Besides the above mentioned cultured products, there are certain other cultured milk products equally suitable for infant feeding. A new cultured product, Matson was recommended for feeding both healthy infants and infants suffering from exudative diathesis from the age of 1-3 months (Simonishvili, 1975). Two humanized milk products named Vitalakt and Ladushka were developed from declarified or demineralized whey for infant

feeding below 1 year of age (Andreevskaya *et al.*, 1982). Recently a new sour milk product has been developed for infant feeding which was prepared by culturing pasteurized milk with lactic streptococci and addition of sugar, followed by another cultured milk preparation enriched with protein, polyunsaturated fatty acids and vitamins (Malygina *et al.*,1989).

Cultured Milk Products for Weaning and Lactose Intolerant Infants

Breso (1974) pointed out that feeding infants exclusively with breast milk would not meet the nutritional requirement for proper growth after the first three months of life and is required to be supplemented with cereals, vitamins and iron. Some infants suffer from a physiological disorder called lactose-intolerance due to reduction in the lactase activity on weaning. Various cultured milk products have already been developed for weaning and lactose-intolerant infants. Information regarding cultured milk products developed for weaning and lactose intolerant infants have already been summarized (Sarkar, 1993). Various cultured milk products developed as weaning foods include Baldyrgan (Sharmanov and Fedotov, 1979), sour paste products (Korobkina *et al*, 1979), Malysh (Sukhova, *et. al.*, 1979), dried acidophilus product (Krasheninin *et al.*, 1980). Pastolakt (Pyatkova *et al.*, 1981), Malyutka (Koroleva *et al.*, 1982), Khishk (Arutyunyan and Sagatelyan, 1987) and yoghurt (Morales *et al.*, 1988), and these are nutritionally adequate for infants and hence could be used to replace/supplement the traditional weaning foods presently available.

Yoghurt and low-lactose *dahi* were found suitable for infants suffering from lactose-intolerance (Chandrasekaran *et al.*, 1975; Rao *et al.*, 1985) due to reduction in lactose content and presence of beta- galactosidase activity. Special cultured liquid and dried milk products such as low lactose types were developed for infants having galactosaemia and lactase deficiency (Ladado, 1980). Getlik *et al.*, (1984) developed a cultured product suitable for the treatment of congenital lactose-intolerance in infants aged only four weeks. Thus various cultured products proved to be effective for alleviating adverse effects of lactose-intolerance in infants.

Special cultured liquid and dried milk products such as low lactose types were developed for infants having galactosaemia and lactase deficiency.

Conclusion

Various cultured milk products could be used for infant feeding in the absence of sufficient production of breast milk, which is also nutritionally inadequate and deficient in vitamins, calcium and iron. Cultured milk products could be the practical and appropriate substitute for infant feeding, keeping in view its nutritional and therapeutic attributes. A number of cultured milk products have already been developed elsewhere and recommended for infant feedings, of which some could be used as weaning food and few were more suitable for consumption by lactose-intolerant infants.

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Corn : Industrial Utilization Perspectives

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Introduction

Corn has the greatest potential in the development of large value industrial uses and it is an excellent raw material for the production of chemicals by fermentation. But, it has not been able to compete with petroleum for many years, except for a few specialist products such as citric acid and antibiotics. The residue remaining after removal of the alcohol is an excellent feed. These materials enter many food products including bakery and dairy products, beverages, confectionery, etc. Industrial uses include paper products, construction materials, textiles, metal castings, pharmaceuticals, ceramics, paints, explosive, etc. Use of corn need to be popularized in view of its great potential so that ways and means are devised to make it a profitable crop of the future Indian economy (Verma and Mishra 1994).

Formulated Feeds

Specialization in agriculture production has given rise to a feed industry which has shown remarkable growth in volume and sophistication over the past 60 years. Formulated feeds are of two types - primary feeds and secondary feeds (feeds made by adding a small amount of another ingredient to a primary feed). Primary feeds are of two types, complete feeds and supplements (including concentrates and premixes). The supplements amounted to 19.8% of all feeds and use about the same ratio of cereal grain to other ingredients as do complete feeds. Complete feeds are more important for poultry and dairy, while supplements are used in larger volume for cattle and swine.

Wet Milling Products

Starch Products

These products are primary products of wet milling. It is recovered in purified form in a yield of 67 to 69% of corn dry substance with a recovery efficiency of 93 to 96% of the contained starch. Corn starch is an important manufactured product because of its usefulness in many industrial applications (Mentzer 1984 ; Russel 1973). Although, uses depend on properties in the dry state, most applications related to its properties as a cooked, hydrated paste. Most commercial starch products fall into one of the following categories.

Corn has the greatest potential in the development of large value industrial uses and it is an excellent raw material for the production of chemicals by fermentation.

Unmodified starch: It is also called milk starch or thick boiling starch. It is the largest volume and lowest cost industrial starch product, amounting to about 60% of all corn starches produced. It is used where its properties of high paste viscosity, strong gels, and retrogration are useful or can be tolerated. Charcoal briquette molding, beneficiation of bauxite ores, and dusting powder are examples. Paper and paper product manufacture comprise the largest industrial uses of raw starch, and consume about 60% of all sold. It is used as an internal binder in forming the paper sheet, as a coating to modify surface characteristics, and as an adhesive in the manufacture of paperboard.

Acid modified corn starch : It has many uses, such as adhesives for paper lamination and clay coating the starch must be incorporated at high solids content. In other uses, such as textile warp-size applications, where smooth, strong film coatings are needed to protect the fibres during weaving, acid-modified starches are preferred. The greater gelling tendency of acid modified corn starches gives desired set and texture in gum confections.

Maltodextrins and pyrodextrins : Dextrins are

degradation products of starch covering a wide range of properties and made by a variety of methods. Maltodextrins are instantly soluble in water, giving clear to hazy solutions of low viscosity. They contribute body in frozen desserts, soups, etc. and they are excellent coverers for spray drying hygroscopic solids such as instant tea and coffee. They have excellent protective colloidal action for fats and are major constituents of coffee whiteners. Low-dextrose-equivalent maltodextrins keep package contents free flowing. Major applications for pyrodextrins are in adhesive for fabricating paper products of all kinds and for remoistenable gums such as on postage stamps and packaging tape, sizing and finishing textiles, thickeners for water soluble, fabric printing inks, and filler for rug backings.

Oxidized starches : Paste of oxidized starch, when spread in a thin layer, dries to a clear, adherent, continuous film, providing the kind of properties desired for paper, sizing paper clay-coating adhesive, textile warp size for cotton and rayon,and laundry finishing, including aerosol spray starch. A small amount is used in the manufacture of wallboard and acoustical tile.

Pregelatinized starches : The instant solubility and different paste viscosity properties may provide new application for corn starch.

Chemical derivatives : Heavily cross-bonded corn starch is used for dusting surgical gloves which must be autoclaved, and the starch will not be gelatinized, but is slowly digested in the body. Hydroxyethyl acid-modified corn starch is used in paper sizing and clay coating, and for thickening of high gloss printing inks. A highly substituted hydroxyethyl starch has been used as a blood plasma extender. Hydroxypropyl starch is approved under food and diet adulteration act for use in thickening foods such as salad dressings. Corn starch with cationic groups such as amino alkyl and quaternary ammonium have found broad use as internal binders in paper manufacture.

Waxy starch : Waxy starches are long and cohesive, whereas regular corn starch pastes are short and heavy bodied. Thin boiling, oxidized and hydroxyalkyl modifications of waxy starches produce improved film clarity for textile sizing and certain types of paper coating. Waxy corn starch is the preferred starting material for maltodextrins because of improved water solubility after drying and greater solution stability and clarity. Waxy pyrodextrins have superior remoistening characteristics.

Dextrins are degradation products of starch covering a wide range of properties and made by a variety of methods.

Higher amylose starch : Its uses of greatest importance are sizing of glass fibres prior to weaving ; a component gummed candies; preparation of a clear, hot water dispersible, edible film for packaging foods, dyes, and other soluble materials and coating paper to reduce water and fat absorption.

Sweetener Products

Corn syrups : The largest volume uses of corn syrup and confections, followed by bakery and dairy products (Economic Research Service 1986 e). Corn syrups also act as foam stabilizers in marsh-mallows and provide desired humectancy to maintain plasticity and they produce desirable viscosity in thick fruit syrups such as in canned peaches. Corn syrups are used in baking and in brewing as a source of fermentable carbohydrates. The more highly converted syrups produce freezing depression for frozen desserts and osmotic concentration for food preservation. The lower converted products help in controlling the number and size of sugar crystals in fondants, ice creams, icings, jams and jellies, and sheen in fruit preserves and pie fillings. Non-food uses are bodying agents in inks, shoe polish, textile finishes, adhesive formulations and pharmaceuticals; in tanning leather and as humectant in tobacco.

Dextrose : It is a major component of tableted candies, chewing gums, gum confections, fondants and hard candy formulations. Other large use is in canning frozen food packs, catsup, frozen desserts, prepared dry mixes, prepared icings, jams, jellies and preserves, pickles, meats, soft drinks, wines and malt liquors. The large single use is in baked goods where dextrose serves as a yeast nutrient, provides some sweetness, and produces crust browing. Its modified form sorbitol is used in the production of synthetic vitamin C.

High fructose corn syrups (HFCS) : Properties of HFCS are similar to those of regular corn syrups, but sweetness is its foremost property. However, HFCS have found application in a wide variety of food systems such as confections, baked goods, table syrup, fountain syrups, sweet beverages, catsup and other condiments and pickles.

Food Products

Kernel components, mainly protein and fibre, remaining after recovery of the corn starch and corn oil in the wet milling process amount to abut one third to the original corn dry substance. These materials are sold almost exclusively as ingredients in feeds for farm animals and pet foods. Corn gluten meal is used primarily as a protein concentrate and pigment source in broiler chicken feeds in areas where yellow skin is a desirable marketing attribute. It is important as a protein source, high in essential S-amino acids i.e., methionine and cystine in poultry, swine, and pet rations.

Corn germ meal containing 22.5% protein is useful in feeds as an absorbent for liquid ingredients such as molasses, fish solubles, choline etc.

Corn Oil

Corn oil is commercially produced only from corn germ isolated by wet milling or dry milling. Because of this supply restriction combined with strong demand, corn oil usually commands a slightly higher price than other major vegetable oils. Its bland flavour and high smoke point are mainly responsible for its popularity. Another reason for the popularity of corn oils is its high contents of unsaturated fatty acids recognised by medical authorities as a dietary component for reducing blood cholesterol levels.

Dry milling products : The most commercially recognised use is boiled grits served as a side dish with nearly all meals (Economic Research Service 1986e). Corn bread or corn muffins can be made from corn meal. Another favourite food is corn flakes. The flaking grits are cooked to a rubbery consistency with syrup, malt, salt, and flavouring added. After the tempering, the cooked grits are flattened between large steel rools followed by toasting in travelling ovens to a golden brown colour. Corn flour has been found to be particularly valuable as an ingredient of

Corn gluten meal is used primarily as a protein concentrate and pigment source in broiler chicken feeds in areas where yellow skin is a desirable marketing attribute.

pancake mixes, baby foods, cookies, biscuits, ice cream canes, ready-to-eat cereals, better breading mixes, and binder for loaf-type sandwich meats. The major uses are foundry sand core binders, oil well drilling mud thickness, and particle board manufacture, using pregelatinized corn flour.

Corn oil is commercially produced only from corn germ isolated by wet milling or dry milling.

Unmodified corn flour is used in briquette binders, adhesive for gypsum board and other construction materials, refining and belletizing ores, fermentation, and paper board.

Other Corn Foods

Traditional foods : Traditional foods include cakes, corn meal and hominy.

Alkaline cooked foods : These are tortillas, tostadas, tortilla chips, corn chips, and dehydrated *masala* flour.

Popcorn : Popcorn is a type of flint corn usually selected by American Indians. Popcorn is being selected on the basis of its expansion volume. There are two popped kernel configurations, "butterfly" which gives the largest popping volume for buttered popcorn, and "ball" which is preferred for carmel coating because of less breakage. These differences are partially inherited and partially due to popping temperature.

Parching : Today, parched corn is a popular snack item known by the trade name "corn nuts". For this product, large flour-type kernels on hot rocks, sand, or ashes was a trial food often used by North American Indians and pioneer hunters.

Fermentation Industries Products

Maize is being utilized extensively in fermentation industry products (Alexander 1973 ; Russel 1973 ; Livezey 1985). Some of the products are as follows :

Beverages : Corn starch grits are used for beverages. Beer and distilled liquors are the leading beverage products with respect to volume production and utilization of corn. However, in India corn use in these beverages is still limited.

Beer and malt beverages : These products are being prepared by primary dry milled corn, corn flakes and corn syrups and liquid dextrose. The use of corn syrup provides the brewing industry a low capital cost and ways to expand, as it meets the growing total and per

capita consumption of beer.

Wines : Although most of the sugar in wine fermentation comes from grapes, specially sweetened wines are made by adding sugar and dextrose. Sweet 'pop" wines and "wine coolers" sweetened with high-fructose corn syrup have achieved significant market penetration.

Distilled liquors : In the manufacture of distilled liquors, corn is the major carbohydrate source for grain neutral spirits, corn whisky, and bourbon. Bourbon is made with a mixture of grains, usually rye and corn, but corn must constitute 51% of the mash bill. Corn whisky made from any corn material, - corn grits, corn starch, corn syrup, and corn sugar are the major raw materials.

Fuel alcohol and chemicals : Excessive starch conversion capacity of the corn wet milling industry adds to fermentation and distillation to prepare ethanol. However, some chemicals such as citric acids, glutamic acids, lysine, and food grade lactic acid, are made more economically by fermentation of corn, dextrose or molasses. Two vitamins, riboflavin (B_2) and cobalamide (B_{12}) are made by fermentation, using dextrose and corn steep liquor.

Antibiotics : Commercial antibiotic production by fermentation was established during World War II and has since grown to a large and important industry. The preferred carbohydrate sources are corn syrup, dextrose, corn starch, lactose and sucrose. Tetracycline is produced in largest volume followed by penicillin, neomycin, becitracin, and streptomycin. A very large volume, prodominatly penicilin, becitracin and neomycin, has been used as growth stimulant in animal feeds.

Enzymes : For enzyme production, whole corn or corn meal supplies the carbohydrates for the production medium, and corn steep liquor is an important ingredient. Production of

In the manufacture of distilled liquors, corn is the major carbohydrate source for grain neutral spirits, corn whisky, and bourbon.

enzymes of fungal or bacterial origin including alpha-amylose, gluco- amylose and glucose-isomerase have achieved high volume production to supply the demands of the rapidly growing fructose corn syrup market from corn starch.

Corn Cob Use

An undermined amount is used as feed for ruminant animals. The cobs are specially useful for blast polishing and cleaning of oil and other contaminants from metal

An important use of corn cobs is in production of furfural and its derivatives which have become important industrial chemicals.

stampings, and castings. Electrical parts can be cleaned without danger of removing insulation. Many finished metal parts are cleaned and deburred by tumbling with corn granules which produce almost no dirt even under the most rigorous handling methods. The free flowing, highly absorbent properties of corn cob granules makes them useful as carriers for pesticides, fertilizers, vitamins, etc. More finely divided fractions are used in hand soaps, cosmetics, and animal litters.

An important use of corn cobs is in production of furfural and its derivatives which have become important industrial chemicals. Furfural finds uses as a selective solvent in extraction of crude petroleum, purification of butadiene, and in the manufacture of grinding wheels. Furfural alcohol polymerized to produce resins that are resistant to the action of acids, alkalis, solvents, and are relatively non-burning.

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Consumer Behaviour in Food Products : A Case Study of Edible Oil in Urban India

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Introduction

An understanding of the consumer behaviour is extremely important in the new environment of competition and consumer awareness, especially in food products markets. These markets are influenced by many socio-economic, personal, cultural,religious, regional, educational, biological, physiological, psychological, extrinsic (related to product environment), and intrinsic (related to product) factors (Khan, 1981). Further, food quality which is a major factor in purchase decision, has many dimensions like microbiological, sensory, nutritional, functional, compositional, convenience, novelty, authenticity, and ethical. Consumer behaviour refers to the who, what, why, when, where and how of a purchase. In other words, it means understanding who buys what, from where, when (time), why, and how. It varies across consumers, products, use, purpose, psychological dimensions, social setting, and level of involvement in the purchase decision. It is a chain of processes from thinking about purchase of a product to the post-purchase behaviour.

However, no detailed studies on consumer behaviour towards food products in the Indian markets have been undertaken. A review of earlier studies reveals a complete lack of information on product and market specific aspects of consumer behaviour. We have only a broad understanding of consumer behaviour in India and developing countries as against the developed world.

An understanding of the consumer behaviour is extremely important in the new environment of competition and consumer awareness, especially in food product markets.

The Context

India has the world's largest area under oilseed cultivation. The country accounts for 15% of the world acreage under oilseeds. It is the world's largest producer of groundnut and castor, and is amongst the major producers of rapeseed. But, still, it has to import small quantities of oil every year to meet domestic requirements. Though the import of oilseeds was as high as a million tonnes (MT), it declined substantially (0.226 MT) by the early nineties. However, in 1994-95, imports again picked up to 0.317 MT and are likely to reach one million tonnes this year. In the last three years, edible oil production has remained more or less stagnant (CMIE, 1996). In view of the increasing population and the increase in per capita consumption of oil to 7.5 kg per annum, domestic production falls short of the domestic requirements of around 68 lakh tonnes of oil for 930 million people (Agrawal,1995).

In a situation where demand is far in excess of supply, the pre- occupation would be more with selling and

supply management rather than with marketing. Selling, however, is the culmination of the marketing process, which is achieved by proper management of all other elements of marketing mix. Therefore, it is necessary to look into aspects of marketing and not of selling alone. In this context, it becomes essential to understand the consumption and buying behaviour of consumers.

An NCAER survey shows that edible fats consumed in India consist of various edible oils, ghee and vanaspati. Edible oils accounted for maximum consumption (2.92 MT) in 1989-90. Vanaspati accounted for around 0.65 MT and ghee for about 0.11 MT. Also, over the years, the growth in consumption has been the highest for edible oils (Rao, 1993). Keeping in view the above facts and to maintain a proper focus, this paper would restrict itself to an understanding of the edible oil market in India, and not vanaspati or ghee.

Objectives and Approach

This paper attempts to understand the preferences for edible oil in different parts of India and to develop an appreciation for the various factors influencing the choice of different edible oils and brands by consumers. This is done by classifying different markets by the region - North, South, East and West; income levels, and the ethnic groups. The basis for this segmentation is the wide variations in the consumption pattern of oils among different sections of the population. The regional analysis is also strengthened by city-wise analysis of the market.

The study relies largely on secondary sources of information, especially the Management Traineeship Segment (MTS) reports of the participants of the various batches of PRM (Programme in Rural Management) and the PWM (Project Work Module) reports of the OYP (One Year Programme) participants at IRMA. These reports are used to gain an understanding of different aspects of the edible oil market so far as they relate to consumer behaviour, as most of these reports are based on primary survey of consumers. The sample size for these surveys ranges from about 100 to as much as 500 consumers in each city. Besides, government, CMIE, NCAER and many other reports, and various periodicals have also been used to gather relevant information.

The current consumption levels of oils and fats in the country are far below the minimum nutritional requirements recommended by the ICMR.

Market Characterization and Purchase Behaviour

Edible oil occupies a very important place in the consumption basket of an average Indian. Yet it is paradoxical that the current consumption levels of this crucial nutrient (oils and fats) in the country are not only below the world average but also far below the minimum nutritional requirements recommended by the ICMR. But nutrition is not the prime factor in the purchase of oils. The particular oil desired by consumers is determined by the their taste preferences and cooking habits.

The dietary surveys also show that cultural factors, dietary pattern or the type of foods cooked, and the method of cooking are important determinants of the quantity of fat consumed. Thus, the percentage of families who use no fat at all ranges from 0-5% of all families in Maharashtra, Gujarat and Tamil Nadu to as high as 43-60% in Karnataka, Kerala and Andhra Pradesh. Almost 75% of the households in the country are in rural areas and these households account for about 70% of the total demand. The remaining 25% of the households residing in urban areas account for the balance 30% (Singh, 1995). Therefore, people living in urban areas consume more fat per head than their rural counterparts. The metropolitan cities have the highest intake. But, it must be noted that the consumption pattern of fats within a metropolitan area or city, may not be uniform across different sections of the population.

As income levels rise, a change in consumption pattern is noticed, with hard fats beginning to show an increase in the total consumption at the expense of edible oils. For cooking oils, the low and lower middle-income classes accounted for more than 75% of the total purchases. Purchases by households with annual income upto Rs. 25,000 reveal that more than 75% of them use cooking oil, 60-75% vanaspati, 50-60% ghee, and less than 33% butter (Rao, 1993).

The bulk of the edible oil purchased is in commodity and loose form. Branded and packed oil accounts for a relatively minor share of the market (51,600 tonnes) though growing at an annual rate of 10-15%. The refined groundnut oil has a

share of 36%, of which Postman (the oldest brand) alone accounts for 60%. Thousands of small oil millers in the oilseed growing areas like Saurashtra in Gujarat rule the market. The market shares of the major companies in oils for 1994-95 reveal that the top 6 companies put together do not account for even 4% of the total vegetable oils market. Infact, even the major 20 players account for only less than 6% of this market. The market leader ITC Agro-tech has only a 1.1% share. Thus, the corporate sector has a minor presence in the edible oil market. Against this, the vanaspati market is highly organized and branded wherein the top two companies have a market share of more than 12% each, and the major 20 firms hold as much 90% of the market (CMIE, 1996).

Purchase Frequency and Lot Size

About 2.2% of the total quantity purchased is in daily lots. Weekly and fortnightly purchases each account for about 14% of the total demand. The largest quantity (64%) is purchased in monthly lots. An estimate of the average purchase lot reveals that the smallest purchase lot is 68 gms per purchase, falling in the category of daily purchases. The largest purchase lot is 54.2 kg among the annual buyers. The average monthly purchasers buy about 3 kg of oil at one purchase. This analysis of the average lot size purchased must be looked at keeping in view the fact that the poorest of the consumers fall in the family purchase category. Thus, an average poor consumer buys 68 g at one purchase while the average well-off consumer buys 3 kg at one purchase.

Most of the middle class consumers in the country buy edible oils along with rest of the food articles every month. The pattern changes in the West, particularly in the state of Gujarat where preferred frequency of purchase is annual, particularly among those who can afford to stock oil.

Region-wise Pattern of Behaviour

In the North, Vanaspati is the preferred cooking medium. While this holds regarding preparations for every day use, demands for specific preparations change. Thus, in the North, for certain special preparations, expeller mustard oil is preferred. The distribution of consumption by regions showed that Northern India, (Haryana, Jammu and Kashmir, Madhya Pradesh, Punjab, Uttar Pradesh, Chandigarh, and Delhi) accounted for the maximum consumption of hard fats like vanaspati (Rao, 1993). For north Indian market, information is available only for Delhi so far as consumption and purchase behaviour for edible oil is concerned.

Tetrapack is emerging as a favourite because of its fool-proof packing, ease of handling, absence of scope for adulteration.

Delhi

In Delhi, which is a multi-ethnic market, it was found that 30% of the market is for refined oil; 37% for vanaspati and another 33% for non-refined oils, mainly mustard oil (Kansal and Varma, 1990-92). Mustard oil is the sole cooking medium for daily wage labourers and, in general, poorer sections of the society. It has been observed that more than 90% of the mustard oil market is in the loose oil category.

Majority of the Double Filtered Mustard Oil (DFMO) users belong to the lower middle and the middle class income segments. About 72% of the consumers shifted from loose oil to DFMO due to its lower price. Another 20% cited non-adulteration as a reason for shifting over to DFMO, and the remaining 8% shifted due to quality. People also preferred DFMO due to its packaging convenience and availability. The state of origin and family income strongly influenced the purchase decision for DFMO. Among the Double Filtered Mustard Oil users, a break-up of the market segments on the basis of the state of origin revealed that the Punjabis and the Purabias are 33% each, Bengalis 16.7% and Kashmiris 13.7% (Kansal and Varma, 1990- 92).

In packaging, tin is preferred to bottle since it is cheaper. Tetrapack is emerging as a favourite because of its fool-proof packing, ease of handling, absence of scope for adulteration, and absence of foreign particles (Kapoor and Agarwal, 1990-92). It, therefore, appears that the Delhi mustard oil market is mainly a lower income segment market. The main criterion for purchase seems to be cost. But the state of origin, and consequently traditional habits also play an important role in purchase of mustard oil.

The western Indian market is largely known for its high consumption of edible oils, especially groundnut. But there are significantly different characteristics of various urban markets for edible oil as evident from the analysis below :

Mumbai

It is basically a market for groundnut oil. Among all types of groundnut oil, Refined Groundnut Oil (RGNO) was considered to be the premium oil. Further , it is branded and packed to bring high value addition. Such branded and packed RGNO is preferred by upper middle class and high income group consumers.

In the refined groundnut oil market, Postman is the favourite brand, with 75% market share. Marathis use all brands of RGNO. Gujaratis and Sindhis are also good consumers of RGNO. The reasons for using a brand ranged from habitual user to perceived attributes like colourlessness, odourlessness and nutritional value. People shifted from one brand to another generally because of irregular supply, problems of smell and taste, and fear of adulteration (Reddy and Mulay, 1994-95).

GUJARAT

In the three cities of Rajkot, Baroda and Ahmedabad (Agarwal and Gupta, 1992), oil is the major cooking medium for 76% of the people. Groundnut oil is the major oil used (92%) followed by cottonseed oil. Other oils consumed are sunflower, safflower, mustard, sesame, rapeseed, and palmolein. Per capita yearly consumption of cooking medium is 22.4 kg, out of which oil is 17.04 kg. The consumption of groundnut oil is 15.64 kg. Across the three cities, per capita consumption of cooking medium is least in Baroda and highest in Rajkot. 46% of consumers purchase groundnut oil on a monthly basis and 42% in season (Nov.-Dec.).

Tendency of monthly purchase decreases with increase in income, while the case is reverse for seasonal purchase. It was found that 25% prefer consumer packs, 8% 5 kg. packs, 24% 15 kg. tins and 43% prefer loose oil. In fact 50% of the people in low income category purchase loose oil. 88% of the consumers purchase Double Filtered Groundnut Oil (DFGO). Smell/flavour is the major influencer in this regard. Refined oil purchase increases with increase in income. But consumers are not very clear about the difference between the DFGO and the Refined Groundnut oil (RGNO). They show a tendency of confusing DFGO for RGNO. The prime attributes for purchase of an oil are : quality (52%), price (40%), availability (22%) and shelf-life (12%). Number of people not consuming groundnut oil increases with increase in income (Anantapadmanabhan and Rao, 1994-95). Perhaps due to health reasons, this group is shifting over to low cholesterol oils like cottonseed, safflower, etc.

MADHYA PRADESH

In M.P., in general, soya oil is quite popular, with "Vital" being the largest selling soya oil brand. The local production and easy availability of soybean seem to be the reasons for its growing popularity. There exist some slight regional variations across towns. In Raipur and Satna, mostly soybean and mustard oils are consumed, while the Jabalpur and Gwalior markets are dominated by vanaspati. The Indore market is mainly for groundnut oil (Kumar and Tyagi, 1991-93). Overall, in M.P. there is a good demand for vanaspati as well.

To sum up, Western India, except M.P., is traditionally a groundnut oil consuming area. But, now, Gujarat consumes maximum quantity of cottonseed oil when compared to other states. This is especially true regarding consumers belonging to central and south Gujarat. This could be attributed to high and fluctuating prices of groundnut oil and the changing cropping pattern in favour of cotton and the increasing health consciousness. Gujaratis normally purchase oil in bulk and stock it for a year. Overall, the scenario in Western India reveals that people in this region prefer groundnut oil. The physical characteristics of the oil and quality in terms of colour, odour etc. play an important role in choosing the type and the brand of oil.

The eastern states are major consumers of mustard oil in the country. The following analysis of major urban markets in the eastern region brings out many other dimensions of consumer behaviour in this region.

WEST BENGAL - Calcutta

Mustard oil constitutes 72% of the Calcutta market and unpacked (loose) oil constitutes 95% of the mustard oil market. 93% of the users of mustard oil use it as the main cooking medium while 83% of them use"white" oils like sunflower, groundnut oil, etc. as support cooking medium. Of Double Filtered Mustard oil (DFMO) brands, Dhara is the market leader with 23% share, followed by Engine, with a 17% market share. Popular mustard oil brands are Ganesh, Jumbo, Aarti and Pujari. Popular refined mustard oil brands are Bavarchi and Hirapanna. Attributes that consumers look for in mustard oil in order of their rank are : pungency, purity, price, and taste.

Most of the branded oil buyers prefer to purchase mustard oil monthly, while about 50% of the loose oil consumers purchase mustard oil weekly. The reasons why loose oil consumers make their purchases weekly are : nearby mill, storage problem, ease of availability and loss of pungency of mustard oil on long storage. The consumer is very price

sensitive and sales of branded oil get sharply affected with the change in loose mustard oil prices. Margin given to retailers is also important factor affecting sales (Sarkar and Guha, 1994-95).

Lower Income Group (LIG) consumers prefer 1/2 kg. and 1 kg. pouches. Higher Income Group(HIG) buyers prefer plastic and PET bottles of 1 kg., 2 kg., and 5 kg., tins. There has been a perceptible shift from unrefined to refined mustard oil. Retailers attribute this shift to increased awareness. A blind test conducted had proved that though the level of pungency was the basis for the purchase of a particular brand, the consumers were not able to identify the level that would satisfy them.

ASSAM - Guwahati

It is the largest trading centre for mustard oil (MO) in Assam. In Guwahati, 90% of the people consume MO. The non-consumers come from Northern and Western states. Along with MO, the HIG consumers buy either refined MO or vanaspati as frying medium. But the demand for vanaspati is being replaced by refined oil as it is not only cheaper but also less harmful to health. On the other hand, LIG consumers purchase only MO and that too only in loose form. Average per capita consumption of MO by HIG is 800-900 g /month and by LIG about 400 g /month. Frequency of purchase is fortnightly or monthly for HIG and weekly for LIG. HIG consumers purchase oil in 1 kg. packs.

Plastic containers are very popular, as they are convenient to handle, though PET bottles are becoming popular. Awareness of tetrapack is very low among consumers. Pungency is a very important factor for purchase of MO. Therefore, expeller oil is considered to be inferior to Kacchi Ghani oil. Pure expeller oil is not acceptable at all. Popular MO brands are Bawarchi and KS ; and popular refined groundnut oil brands are Postman and Dalda

ORISSA - Bhubaneswar and Cuttack

Mustard oil is the preferred oil in Cuttack and Bhubaneswar (BBSR) followed by GNO and RSO (Refined Sunflower Oil) respectively. Preference for RSO is increasing in both the cities, since consumers perceive RSO as pure oil and as being good for health. Dhara is the market leader followed by Suverna in both the cities. The consumers perceive Suverna to be costlier than Dhara. Demand for packed oil is slightly greater in BBSR and almost in equal proportion for loose oil in Cuttack. Reasons for use of loose oil are mainly high price of packed oil in Cuttack, and the usage habit in Bhubaneswar.

Major source of awareness is the retail shop, followed by advertisements in newspapers. Consumption is higher among lower income groups followed by MIG and the least in HIG. Though 49% of HIG consume MO at present, they show a tendency of switching over to RSO at a faster rate. Refined sunflower oil (RSO) is sold mainly in packed form, while groundnut oil is marketed in both loose and packed form in both the cities (Khan and Mishra, 1994-95).

It can therefore be inferred that the Eastern region is still a predominantly mustard oil market. The reason for this could be that the staple foods of people in this region are fish and rice. They prefer pungency in the mustard oil, as it suppresses the smell of fish in the preparations. However, the level of pungency preferred is not consistent among the household. Oil with higher level of pungency is costlier and is purchased by people of the higher income group segment. The lower income group prefers loose MO because of high cost of branded oils. But, slowly, the consumers are using other types of oil, atleast for frying purposes. This can be attributed, atleast partly, to growing health-consciousness.

The South Indian market is traditionally a groundnut consuming market, with the exception of Kerala, where coconut oil is the major cooking medium. Of late, the consumer's choice of oils is changing.

South India

The South Indian market is traditionally a groundnut consuming market, with the exception of Kerala, where coconut oil is the major cooking medium. But, gingelly oil is used for making pickles etc. Of late, the consumer's choice of oils is changing. For example, 95% of the consumers in Tamil Nadu were found to be using groundnut oil. Of the total groundnut oil users, just 2.3% used refined groundnut oil. The per capita consumption was estimated at 5.03 kg. with a standard deviation of 0.13 (Gulati and Phansalkar, 1980).

TAMIL NADU - Chennai

About 63% of the consumers used edible oil distributed through the Public Distribution System in this South Indian metro city. Most of the middle class consumers and richer consumers buy edible oil once a month while the low income groups buy oils once a week. Polythene packets of 1/2 kg. oil were preferred particularly by the lower income segment consumers.

ANDHRA PRADESH - Hyderabad and Secunderabad

About 2/3rd (62.7%) of total volume of edible oil traded in the twin cities is in 15 kg. segment. Branded and packaged 15 kg. tins are available at the wholesaler stage, but such packs are absent at the retailer level. Quality plays an important role at the wholesaler stage, while price determines the trading at retailer stage. Satchets are the fastest moving consumer packs in the market. Major RGNO brands are Crystal, Royal touch, Postman, and Paras, while the major Refined Sunflower oil (RSFO) brands are Sundrop, Chakram, and Sunsudha (Gabriel, 1992-94).

Guntur, Vijaywada and Visakhapatnam

In Guntur, on an average, groundnut oil accounted for 73%, palm oil 19% and branded oils about 8% of the total market. In Vijayawada, these percentages were 55, 14 and 21 respectively. In Visakhapatnam, the shares were 56%, 16% and 29% respectively. The total size of the market in Guntur was placed at 273 tonnes per month, in Vijayawada 524 tonnes and in Visakhapatnam 533 tonnes. Almost 70% of the groundnut oil sales from 15 kg. tins were made by opening the tins and selling the oil loose. 25% of the sales were through institutions, while 10% were made directly to the consumers. The sales of groundnut oil in 15 kg. tins accounted for 95% of the total groundnut oil sales. Small packs of upto 5 kg. accounted for only 5% of the refined oil market. Most of the refined oils were sold in tins or through PDS. Refined oil purchased in tins was used mainly by institutions. The leading brands of refined oils in small amounts were Postman and Saffola (Ahuja and Sarma, 1984-86).

KERALA

In this state, major oils consumed are : Coconut (60% of the consumers), RSO (18%), and Palmolein (15.5%). The factors influencing choice of oil in Kerala are : traditional use (48%), price (23%), taste (18%) and purity (8%) (Gahir, *et al* 1991- 93). Among packed oils, refined sunflower oil (RSFO) has major market share. 61% of coconut oil is sold loose. Gingelly oil has also made its mark. GN oil is prevalent in southern most parts of Kerala, due to presence of Tamil population (Vasudevan and Moorthy, 1994). The preferred pack size is 1 litre. and the most preferred packaging type is polythene pack.

The preference for sunflower oil is increasing, at least in the branded oil segment of the major cities.

In the packed/branded oil segment of Kerala, the ranking of overall brand leaders reveals the following ranks in the descending order : Supreme (RCSO), Sundrop (RSO), Dhara (RSO), Dhara (FGNO), Flora (RSO), and Sunola (RSO) (Gahir, *et al* 1991-93).

Trivandrum

In the packed oil market, the leading oils are RSO, refined & filtered GN oil and Refined Vegetable Oil (RVO) with RSO being the undisputed market leader with a 60% market share. In RSO, the brand leader is Sundrop with 33.2% market share, followed by Postman with 44.23% market share. For Refined Vegetable Oil (RVO) Supreme (cottonseed oil) with 78.75% market share is the leader. Among all brands, 1 litre pack is the largest selling pack (Vasudevan and Moorthy, 1992-94).

Calicut

In Calicut too, the profile of the consumer packs market in terms of types of oil is as follows : RSO 47.68%, RVO 33.5%, GN oil 8.37% and other minor oils 10.51%. In RSO, Sundrop is the market leader, followed by Dhara. In RVO, Dhara is the market leader followed by Supreme. RGNO is not a major edible oil in Kerala. The shares of the major players in Calicut are : Dhara 61.5%, Postman 37.3%,and Crystal and Godrej : 1% each.

Overall, Kerala is a predominantly loose oil market and coconut oil is the most popular oil due to tradition and habit. It can be observed from the above analysis that the preference for sunflower oil is increasing, at least in the branded oil segment of the major cities. The studies lend support to such a proposition. Gahir *et al* (1991-93) state that Kerala is predominantly a loose oil market because in case of coconut oil, price difference between the packed and loose oil is at least Rs. 12-15 per kg. Vasudevan and Moorthy (1992-94) observed that

Palmolein, refined sunflower oil and rice bran oil are gaining ground. They also found that the use of coconut oil for edible purposes has declined in Kerala due to rise in its price and also health reasons.

Regarding brand loyalty, the high market shares of market leaders reveal that people have some brand loyalty. The study by Vasudevan and Moorthy (1992-1994) reveals that though 88% of the consumers ask for a particular brand, only 50% of them go to next shop in case of its non-availability. Only 8% of the users were found to be fully loyal to a particular brand. This view is further supported by Gahir *et al* (1991-93) who state that switching from one oil to another is not very common, but a lot of brand switching in the same oil takes place due to the lower price of competing brands, non-availability of preferred brand, better quality perception towards rival brand, and the advice of the retailer.

KARNATAKA

The major edible oil in Karnataka is filtered GN oil. The other major oils are sunflower, safflower, gingelly, cottonseed and palmolein. The factors influencing the choice of edible oil are tradition, smell, taste, price and availability (Gahir *et al* 1991-93). In Karnataka, 4% of consumers blend palmolein and GN oil in the ratio of 1:2. A blend of palmolein and coconut oil is preferred in Mangalore. The reasons for blending are price and blandness (Gahir *et al* 1991-93). The form of end purchase of edible oil in Karnataka is mostly loose in all areas among HIG consumers. Consumer pack segment is a very small part of the total edible oil market.

Bangalore

Bangalore is a major loose oil market. In the total edible oil market, GN oil is the most popular, followed by sunflower oil. Major oil used for household consumption are FGNO and RSO. Cottonseed oil and ricebran oil are popular among hoteliers and other institutional buyers (Gahir *et al* 1991-93). Market shares in packed oil market reveal that RSFO is the leader with a market share of 56.6% followed by R&F GN oil with 21.3% share. In GN oil, KOF's Safal is the market leader. The reason for this is the prompt response to changes in the market and competitive pricing by the organization. Due to RSO, GNO share is declining. Safal has 50% market share in GNO market followed by Dhara with 25%. In RSO market, Sundrop is market leader with 29% share and in RVO, Supreme is the market leader with 43% share closely followed by Dhara (42%) (Vasudevan and Moorthy, 1992-94).

It is observed that groundnut oil is the most preferred oil for every day use in most of the Western, Southern and Central Indian states.

Hubli-Dharwad

Like Bangalore, in Hubli-Dharwad too, the most popular oil is GN followed by Sunflower. The loose oil market is very significant in this twin town. Loose oil is adulterated and the prices depend on extent of adulteration (Gahir *et al* 1993). In the pack segment, the most popular oils are RSO, and R&F GNO with market shares of 43% and 42% respectively. In RSO, Sundrop is the market leader with 30% share : in R&F GNO, Safal is market leader holding 45% of the market and in RVO, 63% market share gives Suffola that market leadership (Vasudevan and Moorthy, 1992-94).

Mangalore

On the other hand, in Mangalore, the popular edible oil is coconut oil followed by RSO and RGNO. Refined rapeseed and soy-oil are importd from MP and Rajasthan. But the sale of these oils is usually to institutions only. (Gahir *et al* 1993). The shares of different oils in the packed segment are : RSO - 66%, RGNO - 12%, RVO - 6% and others 16%. In RSO, Dhara is the market leader with 36% share closely followed by Sundrop (34.4%). In GNO also, with 64% share, Dhara retains the leadership. In RVO, Supreme is the market leader (43.4%) followed by Dhara (42%) (Vasudevan and Moorthy, 1992-94).

Gulbarga

The major oil used for domestic purposes in Gulbarga is safflower (Kardi) oil, followed by GN oil. Safflower oil is a very important oil here and is considered to be good for health. But it is not popular in institutional markets due to its high price. It is being fast replaced by sunflower oil in domestic markets also because of the same reason. Another reason is widespread adulteration. Since Kardi oil is a light oil if it is mixed with other oils, it rises up, giving the adulterated oil a strong smell of kardi oil. This issue holds a lot of relevance in light of the fact that Gulbarga also has a huge market for loose, unbranded oil (Gahir *et al* 1991-93).

To sum up, in Karnataka, RSO is becoming the major oil due to its low price and easy availability. Though there is a large market for loose oil, brand loyalty is quite high, as can be inferred from the market shares of brands. The study conducted by Vasudevan and Moorthy (1994) lends support to such a proposition. It reveals that about 47% of the users are fully loyal to the brand that they are using and 66% of the consumers ask for a specific brand. About 85% of such consumers go to the next shop if they are unable to get the brand of their choice.

Dietary considerations have so far been neglected by most consumers in their choice of fats and oils for food uses.

Regarding South India, it can be concluded that it is a groundnut oil consuming area, except in Kerala, where coconut oil is traditionally used. Though these are the most preferred traditional oils, sesame oil is preferred for certain special preparations. Growing health consciousness has led to the incidence of refined oils, and of late, has resulted in the growing popularity of sunflower oil. The ITC brand, Sundrop is the brand leader across all states in the RSFO segment. The South Indian market is different from other markets in that hard fats like vanaspati are not consumed here, unlike in North and Central India. There is also no consumption of mustard oil or cottonseed oil.

Conclusions

It is observed that groundnut oil is the most preferred oil for every day use in most of the Western, Southern and Central Indian states. In North, hard fats like ghee and vanaspati are preferred. But certain areas and lower income groups prefer mustard oil even in the north. In eastern India, expeller mustard oil is relatively more favoured by the consumers. Consumer preferences are determined to an extent by habits and taste, which develop over time and change on the basis of local availability and relative prices. Kerala prefers coconut oil, Gujarat groundnut oil, U.P. and West Bengal mustard oil and M.P. soy oil, primarily due to the local production and easy availability of these oils in the respective states.

Dietary considerations have so far been neglected by most consumers in their choice of fats and oils for food uses. Of late, in view of the medically established close relationship between the incidence of cardio-vascular diseases and the intake of saturated fats, there is a trend to change from such fats to poly-unsaturated oils in the elite and affluent sections of the society. For the same reason, the consumption of poly-unsaturated oils, like those of soybean, sunflower, cottonseed, sesame and safflower has been rising relative to those of coconut and groundnut oils which have more saturated or non-saturated fatty acids. The area under these crops has also been increasing over the past few years.

However, the impact of price cannot be ruled out. Palm oil is also a saturated oil, but its share in consumption has increased in recent years solely because of its low relative price and assured availability. Overall, the market trends seem to hint that Sunflower oil is going to be the most preferred oil by consumer in the future. Emphasis on purity and quality of the oil has increased and consequently the share of branded oils in the market is increasing.

Brand awareness and brand loyalty are increasing atleast in some sections of the society. This can be easily verified by looking at the high market shares of some brand in most parts of the country. There is a shift from loose to packed oils across the country especially among the middle class. The market trend augurs well for marketers of branded, poly-unsaturated oils. However, the growing awareness and quality consciousness among the consumers makes it imperative for the marketeers to be sensitive to the market needs.

Brand awareness and brand loyalty are increasing atleast in some sections of the society.

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membranes, these are used in a wide variety of applications now, mainly in biotechnology processes, food/dairy and chemical processes. Commercial ultrafiltration and microfiltration system are in operation mainly in France including EEC, USA, Russia, Japan, etc. These systems are easy to clean by conventional CIP system and give higher flux and concentration because of its higher operational pressures and velocities. These systems are best in the processes which demand high level of sanitation and continuous operation especially in biotechnology, food processing and pharmaceutical processes. The mineral membranes systems are costly and are only preferred where the end products are of very high value.

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NEW MACHINERY

Endoline's Packaging Solutions

Endoline Machinery Ltd manufactures a wide range of packaging machines for all end-of-line packaging applications, including case sealers, case and tray erectors, case packers and conveyor systems. Their philosophy is to build modular machines that can be arranged in several ways to produce a customized system. For more details, write to :

Endoline Machinery Ltd
Stratton Business Park, London Road, Biggelswade, Beds, U. K.

FEC's X-Force Conveyor

Food Engineering Corporation (FEC) have announced the introduction of their X-Force conveyor.

According to FEC, their patented support system allows a less than 0.0001in. vertical movement of the trough, which virtually eliminates product breakage. The horizontal motion also reduces the amount of coating or seasoning loss that is typically associated with other types of conveyor. Their patented drive system operates in an oil-free environment. This drive system is capable of changing the conveying direction and velocity on-line, without stopping the conveyor. For further particulars, please contact Food Engineering Corporation, 2765 Niagara Lane, Minneapolis, MN55447, USA,
Fax [612] 559-4657.

Hindson's New Printer

A new high performance desk-top label printer has been brought out by Hindson Print Ltd, a division of Ferguson UK Ltd, of Strawberry Place, Newcastle-upon-Tyne, (Tel : 0191-261 1171).

Their SATO 412 gives a high quality print-300 dpi (12 dots per mm) at speeds up to 150 mm a second. Apparently, all popular bar-codes, graphics and alphanumeric texts can be produced on demand, for one, one thousand or more labels. More details can be got from the company.

Dawson Rotaclean Bottle Rinsing System

The high speed Rotaclean range rinse-cleaning systems is now available. Incorporating a combination of rinsing and draining, to recycle filtered liquid for re-use. The Rotaclean has been designed to meet the most exacting container cleaning needs. With this multi-jet unit, change-over from one size container to another is quick and does not require the use of tools.

To achieve maximum economy in water consumption, the Rotaclean system automatically shuts down its rinsing jets when the machine is not operating. In addition, a fully enclosed drain collects all spent rinse fluid for either filtration and recirculation or for discharge at the floor level drainage point. A rinse air pressure regulator shuts down the machine if the supply pressure drops below the required operating level. For more details, write to BWI Dawson of Stephensons Way, Thetford, Norfolk, U.K.

New Roll Plant Extends Weight Range

European Process Plant Ltd (EPP) have announced the introduction of the Konig 2000 Rex Automatic Type Industry head machine which has the capability of producing dough pieces in the weight range from 35 to 130 g. This will enable bakers to change production from bridge rolls to giant baps. or any other morning goods type in between. The Konig 2000 is a new version of the successful 8-pocket roll plant, and has been specifically engineered to the needs of the British market. In fact, EPP tell us they already have orders for three of the new units. This unit has an output potential that ranges from 12,000 per hour-four across, through 18,000-6 across to 24,000-8 across. For more details, contact : European Process Plant Ltd, EPP House, Kiln Lane, Epson, Surrey, U.K.

Trimco's New Cold Rooms

Trimco Coolair Ltd have launched a range of step-in cold rooms that provide storage capacities for 49 to 409 cft. These cold rooms offer three different temperature ranges, covering the various chill, meat-fish and frozen food applications. Each cold room incorporates an automatic defrost system and operator controls ensure that the set-point temperature is easy to adjust. The floor is given a non slip surface and the doors have lockable handles with an internal safety release catch. For more details, contact : Trimco Coolair Ltd., Newby Road Industrial Estate, Hazel Grove, Stockport.

UV Disinfection of Abattoir Rinse Water

Hanovia Ltd have developed a new series of ultraviolet water disinfection units for use after an ion exchange system to produce softened rinse water in abattoirs. Designed for central or point-of-use applications, these units will disinfect warm or cold water and can be used with automatic, motor-driven cleaning mechanisms. Abattoirs often use ion exchange systems to produce the softened rinse water they need but the resins used can create suitable conditions for microbial growth, which could lead to possible product contamination from the rinse water. Details can be had from Hanovia 145 Farmham Road, Slough, Berks, U.K.

Dodman Vegetable Segmenting Machine

This unit is designed principally to segment whole cabbages up to 300mm in diameter, including removal of the core, and also to floret and core cauliflowers. Upto 60 heads per minute can be achieved. For further particulars, contact : Dodman Limited, Hamburg Way, North Lynn Industrial Estate, King's Lynn, Norfolk PE30 2ND, England.

Index's New Refractometer

A new refractometer that combines accuracy with a range of benefits has just been launched on the market by Index Instruments Ltd of Industrial Estate, Bury Road, Ramsey, Huntington, Cambs, (Tel : 0148 781 4313).

Known as the TCR 15-30, this fully automatic refractometer is thought to be the first instrument of its kind controlled by a television-type infrared remote control unit. All the instrument's parameters are set-up using the controller, and this ensures that once the analysis conditions have been set, they cannot be interfered with by others. For more details, contact the firm in the above address.

Interlocking Partitioning

A new interlocking partition, called Flexi-Part, has just been introduced by Chepstow Industries of Units 1, 2 and 4, Upper Nelson Street, Chepstow, Monmouth, (Tel : 0129 162 7300).

This easily demountable partitioning has been developed to allow the economical transformation or containment of areas in a factory or warehouse. It can be used to conserve heat, control fumes, screen buildings or end the problem of dust and dirt from refurbishment work being undertaken elsewhere on-site. Flexi-Part is manufactured from strong, high tensile non woven mesh laminated between layers of PVC film. Conforming to the British Standard fire resistance and self-extinguishing tests, this partitioning is very light; (just 250g a sq m). Flexi-Part can be custom- built by plastics welding and can easily be increased in height or width. It is available in a multitude of colours, can be transparent or opaque and needs no framework as it can be hung from roof trusses.

Novopac's Wraparound Tray Packer

New from Impianti Novopac of Italy is their Model VF 150 wraparound case and tray packer. This machine can collate and pack products contained in cylindrical or rectilinear bottles, jars or cans in various configurations at speeds up to 20 packs a minute. Containers are fed into the machine at right angles to the case- forming line, collated as required and carried to the first forming station, at which point they are placed on printed blanks of carton material or card-board fed from an integral magazine. Further stations along the line wrap the packing material around the collation to

form either complete cases or open trays. The flow is continuous and the finished packs are discharged on to a rolling belt conveyor. Dimensions of the cases that can be formed range from 200 by 150 by 120 mm to 450 by 300 by 360 mm and tray dimensions range from 200 by 150 by 50 mm to 450 by 300 by 360 mm.

For more details contact AssiDoman Medway of Medway House, New Hythe Lane, Aylesford, Kent, U.K.

Cider Farm Extends Range with New Labelling System

A new electronic desk-top labelling system from Nor Systems of Harwich, Essex, has given a Cornish cider farm scope to increase their product range.

The Original Cornish Scrumpy Ltd of Penhallow, Truro output more than 40 fruit products for sale locally. These include ciders, country wines, natural fruit juices, jams, chutneys, mustards, honey and mead. Before installing the new labelling system, the tie-on point-of-sale labels on the preserves were bought in completely printed. New generic labels as supplied part-printed in reels, in the same attractive four-colour design that is used on the lid covers. A NOR 2242 electronic desk-top printer adds the name of each individual product to the labels, as required, before they are separated and hung on the jars.

Retaining Fresh Flavour in Plastics Bottles

The French company Pampryl have developed a plastics bottle that keeps juice as fresh as in a glass jar. Conventional plastics materials, like PET and PVC, do not keep fruit juice in the optimum conditions, as they are oxygen-permeable and thus allow the product's organoleptic profile to deteriorate.

Pampryl's new container is made of Barex, a resin from the polyacrylonitrile family, that was developed by British Petroleum and is distributed by the German company Velox. Fruit juice kept in these containers are said to be as fresh as in a glass jar.

For More details, contact : Pampryl, 26 rue Carnot, F-92300 Levallois Perret, France, Fax : +33 1 47 48 11 39.

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RESEARCH ROUND-UP

Karnataka Set to Strike Bio-diesel

A Karnataka entrepreneur is acquiring technology from an American company, Hass-Cal Industries (HCI), for generating a high-energy fuel from rice-husk and rice-straw through a technology involving fermentation, reverse-osmosis and ultra-filtration.

According to HCI President James Lucas, the fuel has approximately the same heat-energy content as fossil diesel fuel and has run a conventional diesel engine. HCI has a patent on its separation technology involving a process of reverse-osmosis and ultra-filtration. Its British partner, Agrol, has developed a fermentation technology which works much faster than the conventional yeast-process. Karnataka entrepreneur Cdr (retd) Joshua estimates that 70 gallons of the fuel (which is called bio-diesel) can be processed from a tonne of rice-husk and rice-straw, in addition to high-protein cattle feed and silica for industrial use. The project will be implemented in two stages. The first stage involves the transfer of technology and the setting up of a pilot demonstration unit and the next phase involves the commercial exploitation of the technology by setting up a plant with a capacity to process 640,000 tonnes of rice-husk and rice-straw a year.

Scientists See Good Scope for Gene Bombardment Tech. in Growing Rice

A high-velocity gun which shoots gold-coated genes has been used to engineer new varieties of rice. According to agricultural researchers, the technology "holds great promise" for rice-growing countries like India. British scientist Paul Christou of the John Innes Centre in Norwich told an international conference organized by ICAR in New Delhi that the gene bombardment technology developed in the United States eight years ago was now ripe for transfer to rice-growing developing countries. According to Mr Christou, "bombardment remained the method of choice". Rockefeller Foundation was committed to transferring the technology to countries that depended on rice for feeding their population. Scientists at the conference said that the gene gun had been successfully used to deliver a toxin gene from a soil bacterium known as *Bacillus thuringiensis*(BT). According to researchers of the International Rice Research Institute in Manila, research on BT rice was being conducted in at least a dozen countries and that it may eventually be grown in 30 countries.

While BT rice was still confined to laboratory farms, herbicide resistant rice varieties - produced with the help of bombardment technology - were already growing in open fields in the US. Although the original genetic gun was expensive, a number of simple and cheaper models were being tested, with encouraging results. Ms Pritilata Nayak and her colleagues of the Bose Institute have used the bombardment method to introduce BT gene in IR64 rice.

Testing Herbs to Fight Bacteria

Scientists in Bombay have devised a novel technique to study exclusive antibacterial properties of medicinal herbs that can be extensively used in traditional Indian medicine systems such as Ayurveda.

In this new technique developed at C.B. Patel Research Centre, Bombay, the aromatic herbs were extracted with hexane filled in tiny sterile tubes, and the volatile components present in the extract were tested against a range of bacteria. This method was found to be more accurate than existing methods as there was no interference from non-volatile components. It was also possible to estimate how much bacterial growth was inhibited by each extract.

The aromatic plants tested by the Bombay team included *Eugenia caryophyllus, Thymus vulgaris, Cannamonum zeylanium* and *Cuminum sp.* Of these, *Thymus vulgaris* was found to be most effective against the bacteria tested.

First Aid Medicine Launches Food Concentrate

The Mumbai-based First Aid Medicine Ltd has launched world's first green food concentrate fortified with vitamins, including the full B complex range and is the only known vegetarian source for vitamin B_{12}. According to a press release of the company, the new medicine - Spiruvita - as it is named, is also rich in chelated minerals like iron and zinc, co-enzymes and amino acids. Derived from a food-synthesising, chlorophyll-rich, blue-green algae the protein content is an amazing 70 per cent of its dry weight. It has the highest concentration of naturally occurring Beta carotene.

Don't Waste the Orange Peels : Tap Their Power

Using ripe banana and orange peels, vegetable wastes and metal scrap, Indian scientists have devised "biobatteries" which were used in running calculators, wall clocks and video game toys.

The biobatteries were designed by a team of scientists from S.V. University, Tirupati, as an alternative to conventional low-power dry cells for use in low voltage appliances. Low-power dry cells are now becoming expensive and are often not available in time in villages.

Each biobattery consisted of a plastic vial containing a paste of vegetable and fruit wastes, into which copper and zinc electrodes were inserted. It produced low voltage power measuring 0.5 to 0.8 V.

The scientists reported that when the cumulative power of 2-4 such batteries connected in series was applied to devices, it could make them functional without using conventional low power dry cells. The life of the battery was over four weeks without changing electrodes. Further studies are needed to understand the electrochemical mechanisms behind production of low voltage power by biobatteries.

To prepare the biobatteries, they first macerated ripe banana and orange peels or vegetable scrap into a fine paste without adding water. For electrodes, they selected pieces of copper and zinc sheets from metal scrap merchants and cut them into plates measuring 4 cm by 2.5 cm. Each electrode was connected with a short piece of insulated wire through a small hole made at one end of each electrode and the electrodes were inserted into 20 g. of the paste taken in 30 ml plastic vials. In a second set of experiments, the scientists inserted the electrodes directly into fresh and intact vegetables. Of the various combinations, the paste of ripened banana peels with copper-zinc electrodes was found to be most effective. The battery performance was found to be affected by size and quality of the two electrodes and the electrolyte. Further work on design and construction of biobatteries with different electrode combinations is needed to make them handy, durable and popular.

Need for Biological Farming

Initial reluctance to organic agriculture from certain quarters is based more on lack of awareness of the benefits than on any real issue. Organic Agriculture is the pathway that leads us to live in harmony with nature. It is the key to sound development and sustainable environment. It minimizes environmental pollution and the use of non renewable natural resources. Organic agricultural products should be produced within a sustainable farming system. Soil fertility should at least be maintained if not improved by using natural site specific resources and organic by-products.

Soil erosion and environment pollution should be reduced to the minimum through the implementation of appropriate conservation principles. The use of fossil fuels and other non renewable resources must be minimized.

Products as far as possible should be free from residues harmful to health.

In soil, organic matter should be increased by using legumes, shade tree loppings and soil activation by correcting soil pH to enhance microbial multiplication and activity. Varieties of crops resistant to pests and diseases should be selected and multiplied. Plant protection measures should be taken by regulating microclimate and improvement of the ecological diversity instead of only by pesticides. Return of nutrients removed by using a mineral balance calculation to avoid water pollution by leaching. All available organic matter on the farm should be composted and returned to soil.

The whole methodology of production should be in harmony with nature. This is in essence the hallmarks of nature farming. Ecofarming strives to create a cultivated but balanced ecosystem designed to sustain human life. It is a way of using natural resources without destroying them.

Growing Tomato on Sand Dunes - Israelis Teach Indians How

Lessons from people who have grown vegetables and flowers on sand dunes in Israel promise harvests of plenty to Indian farmers. Agricultural experts sent from Tel Aviv are passing on to their Indian counterparts skills that have helped them get phenomenal yields back home. Israel has sent four teams of agri-experts to train farmers in Maharashtra, Karnataka and Goa. The average annual rainfall in Israel is barely 40-50 cm, with seven months of the year being hot and dry. Although they do not have enough land or even water, they get a yield of 300 tonnes of tomatoes per hectare even in totally arid regions, through 10 months. Israel is a pioneer in drip irrigation. The tiny country, nearly half of which is desert, exports a wide range of fruits and flowers.

The Israeli experts feel that their skills in dairy, poultry, plant protection and developing new varieties of crops can help India. They explained to Indian farmers all about *fertigation* - applying water in high frequency, mixed with accurate measures of *chemigation*, or using fungicides and herbicides, the use of monitors in agriculture, the biological control of pests and how greenhouse-like 'net houses' were being promoted in Israel. Tiny quantities of fertilizers carefully calculated and spread out ensured that costly chemicals were not wasted and ground water not harmed. However, the experts also warned that such hi-tech methods, when carelessly employed, could lead to problems like salinisation, alkalinisation, leaching or compacting of soils.

Acidity, Peptic Ulcer may Cause Cancer

Persistent acidity, heart burn and peptic ulcer, if ignored over a period of time, can cause cancer, according to study conducted by Heart Care Foundation of India (HCFI). Patient with long history of these afflictions should go in for a thorough medical check-up and not ignore the malady.

Urine Therapy

From simple tooth ache to the most-dreaded, painful and contagious disease like vaginal herpes could be cured by auto urine therapy (AUT), claimed the Chairman of the seven-year-old Water of Life Foundation (India), Mr. G.K. Thakkar of Mumbai. Gargling a mouthful one's urine would prevent uprooting of a loosened tooth while a 'urine pack' (folded cloth soaked in urine) will help cure the vaginal herpes. Mr. Thakkar, who had been practising AUT for nearly a decade now, urged the central government to appoint a high level committee of medical scientists to "disprove" the Foundation's claims of the efficacy of the urine therapy and should take urgent steps to spread the importance of AUT to the millions of people in the country before it is too late. He claimed all eye diseases, including herpatic chronic conjunctivitis, ear diseases and arthritis could be cured with the help of a few drops urine.

The foundation has nearly 2,000 members most of whom practice the therapy. He claimed that nearly half-a-dozen injections, meant for heart problems, miscarriages and impotency, were being manufactured using urine.

'Mad Fish' Disease

Researchers at Toronto have discovered a new bacterial infection that can pass from fish to human beings. Dr Donald Low, head of microbiology at Mount Hospital has termed the infection as a "brand new disease," and said *streptococcus iniae*, once considered a threat only to fish has been found to be spreading among the humans. It causes 'mad fish' disease - these fish have their eyes bulged out and they swim erratically before they die. In humans, the bacterium causes rapidly spreading inflammation of the skin and meningitis has erupted in at least one of the seven stricken with the disease. Dr Low said the bacterium was first detected in dolphins in 1972 but was not considered dangerous to humans.

Low-Calorie Fats

With the growing popularity of fat-free cookies and

snacks, much time has been spent developing reduced-calories functional fats that can replace fat in foods where the majority of calories are obtained from fat. The most recent products are fats composed of short and long chain acid triacylglycerol molecules (salatrim). The short chain fatty acids are acetic acid, propionic acid, butyric acid, or a combination of all three. The long chain portions consist of hydrogenated vegetable oil, with stearic acid being the main component. As a result, these unique fats contain approximately 5 kcal/g compared to 9 kcal/g in typical fats. The reduced calorie content as well as certain physical properties have made these products excellent candidates for replacing fat in chocolate. When properly handled, these fats do not bloom, do not require tempering, have similar melt and mouthfeel of chocolate, and have the desirable "snap" associated with chocolate. When used in combination with polydextrose, high-quality, reduced-calorie, reduced-fat chocolates can be made.

The Future of Confections

The Calorie Control Council released findings from its 1995 survey which indicated that 89% of the adult U.S. population consumed sugar-free, low-calorie, and reduced-fat foods and beverages on a regular basis. These products were enjoyed frequently, meaning about a third of the population ate these foods daily and 69% ate them at least once a week. Data indicate that these "good for you" products are being met with higher levels of consumer acceptance and the demand for higher quality products will continue to rise. As regulations governing the substance that are allowed in foods continue to change, it remains the responsibility of the ingredient manufacturer to meet the demand for quality, functional products for use in confections, as also the regulatory requirements. Perhaps the day that we can enjoy a truly satisfying candy bar with rich, low-fat, sugar-free chocolate and a reduced-fat caramel and creamy milk chocolate center (with virtually no calories and does not promote tooth decay) is not that far away.

TRADE FAIRS & CONFERENCES

Fourth World Spice Congress in January '98

The Fourth World Spice Congress will be held in Madras during January 1998. A joint meeting of the All India Spices Exporters Forum and the Spices Board Officials held in Cochin on October 7 decided to hold the Congress during 22, 23 24 and 25th January 1998.

The meeting presided over by the Chairman of the Spices Board, Mr. V. Jayashankar IAS also constituted various committees for the conduct of the congress. Chairman, Spices Board is the Chairman of Congress and Mr. George Paul, Chairman of the All India Spices Exporters Forum is the Co-chairman. Director Marketing Mr. K.P.G. Menon is the General Convenor and the Publicity Officer of the Board, Mr. P.S.S. Thampi is the Organizing Secretary.

Short Term Courses in Grain Science

April 13-16 (1997) : Biscuit and Cakes Manufacturer's Association Annual Convention, Orlando, FL Contact Francis P Rooney, BCMA, 1400L St. N.W. Suite 400, Washington, DC 20005; 202/898-1636

April 20-22 (1997) National Pasta Association Annual meeting. Palm Springs, C.A., Contact : Louise Kamali, NPA, 2101 Wilson Blvd., No.920, Arlington, VA 22201;703/841-0818

April 27-29 (1997) Miller's National Federation Annual Meeting. Washington, D.C., Contact : MNF, 600 Maryland Avenue S.W., Suite 305 West, Washington, DC 20024;202/484-2200.

Sept. 22-26 (1997) International Baking Industry Exposition. Las Vegas, NV, Contact : Nikki Gayhart, ABA, 1350 I st. N.W. Suite 1290, Washington, DC, 20005; 202/789-0300.

International Pepper Community Meetings

The 25th International Pepper Community meeting will be held in Cochin from the 6th October to 11th October 1997. The venue will be Cochin. This was decided by the Spices Board in consultation with the spices exporters.

International Conference on Frontiers in Biotechnology

Date : November 26-29, 1997

Venue : Trivandrum, India

Scientific programme of the Conference consists of Plenary and Invited Lectures and Contributory papers as Poster presentations. The areas to be covered are : Industrial Biotechnology, Food and Pharmaceuticals, and Environmental Biotechnology. Further information can be obtained from :

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Biotechnology Unit
Regional Research Laboratory, CSIR
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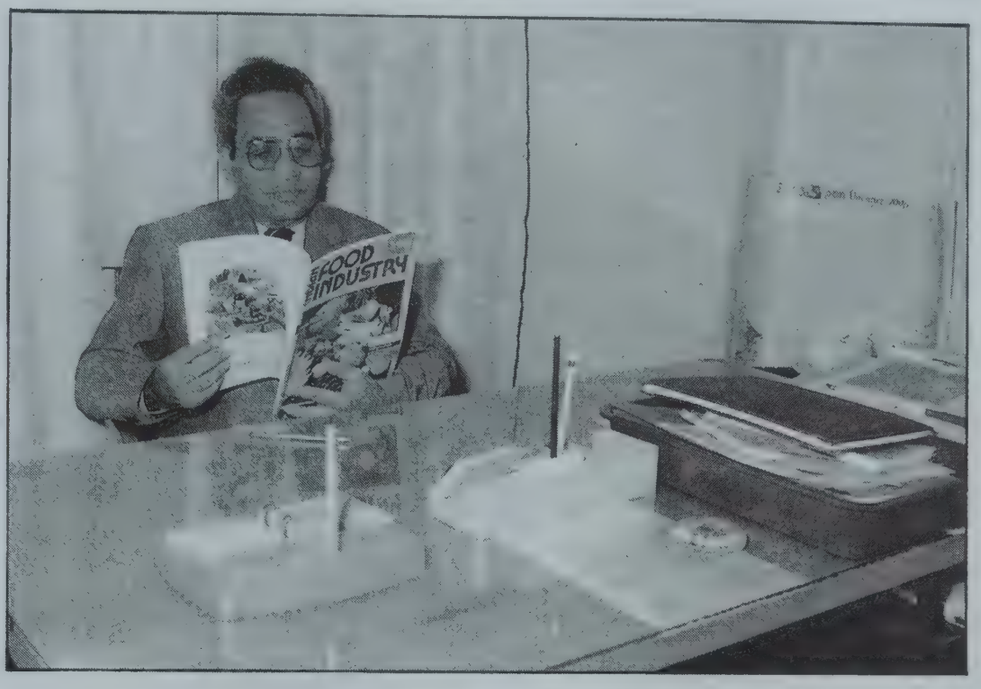
Our New President

Dr. C. L. Nagarsekar

President, AFST (I) for 1996-97

A.F.S.T.(I) in the hands of a Dynamic & Distinguished Leader for the year 1996-97



Dr. C. L. Nagarsekar, Food Consultant (Dr. Nagarsekar Associates, 2/202, Mehta Parle, Mahim, Mumbai - 400 016) has taken over as President, AFST(I) for the year 1996-97.

A unique combination of high academic achievements coupled with long industrial experience of Dr. Nagarsekar will go a long way in progressing the activities of AFST(I) in the year ahead. With his longstanding background of academic excellence and industrial involvement, soon after taking over the Presidentship, he stressed the need for ensuring a close link between AFST(I), the Food Industry and Govt. Departments so that AFST(I)'s existence and utility is recognised and felt more strongly than before. He said his aim is to fulfil this dream come true. Besides, his active involvement in information dissemination activities in the field of Food Science & Technology through the media including Newspapers and Magazines, TV & AIR, are sure to yield fruitful results in widening the activities of AFST(I).

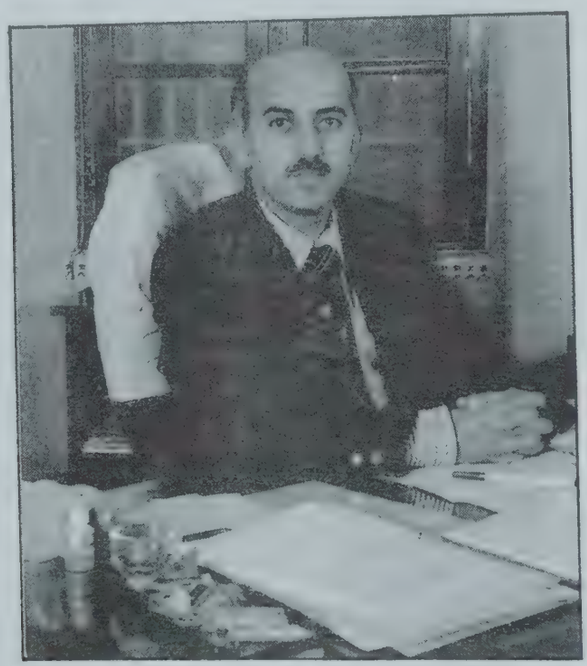
His long experience in Senior Managerial positions in various food industries in the areas of Production, Quality Control, R&D, Labour and Personnel, Marketing & Sales, Finance, Machinery Maintenance and Liaison with Government agencies and industry will certainly enable him to carry forward the objectives of AFST(I) to greater heights. He has travelled widely ; the countries include Fiji, Japan, Hongkong, Singapore, New Zeland, Australia and Nepal. Thus, an effective liaison between the Food Scientists & Technologists on the one side and the Food Industry on the other in India and abroad is expected to be achieved through the medium of AFST(I), to ease the path to carry it forward in the years ahead.

His association with AFST(I) runs for several years, having held the positions of Hon. Secretary, Vice-President and President of Mumbai Chapter and Trustee of AFST(I) Education and Publications Trust. Therefore, his tenure as the President of AFST(I) is sure to usher in an era of allround development and unparalleled achievements during 1996-97.

IFI wishes him the best of luck and success in his endeavours as President, AFST(I).

Chief Editor

AWARDS



Dr. V. Prakash,

Director, CFTRI,

Awarded S.S. Bhatnagar Prize for 1996

Dr. V. Prakash, the dynamic Director of CFTRI, Mysore, is the proud recipient of Shanti Swaroop Bhatnagar Prize in 'Biological Sciences' for the year 1996. The award is conferred on him for his valuable contributions in the field of Seed Proteins.

His current research interests cover the areas of Structural Biology of Plant Proteins, Structure-Function Relationship of Proteins and also Stabilization of Enzymes of Industrial Importance.
Dr. Prakash is an active member and Fellow of the AFST(I).

The Government of Karnataka also honoured him by conferring the Rajyotsava Award for 'Science'.

IFI congratulates him and wishes him many more laurels in the years ahead.

DATA BANK

CMIE Estimates of Agricultural Production 1996-97

Crop	Weight % 1979-82	Production ('000 tonnes) 1994-1995	1995-1996	1996-1997	Percent Change 1995-96/1994-95	1996-97/1995-96
Rice	29.74	81158	79460	82000	-2.1	3.2
Wheat	14.45	65469	62620	65500	-4.4	4.6
Jowar	4.43	9200	9870	11000	7.3	11.4
Bajra	1.87	7150	5400	7500	-24.5	38.9
Maize	2.41	9120	9570	9800	4.9	2.4
Ragi	0.95	2430	2630	2650	8.2	0.8
Small Millets	0.47	870	810	820	-6.9	1.2
Barley	0.66	1580	1670	1800	5.7	7.8
Gram	3.07	6210	5020	6000	-19.2	19.5
Tur	1.58	2190	2350	2700	7.3	14.9
Other Pulses	3.29	5720	5600	6500	-2.1	16.1
Groundnut	5.60	8255	7650	8500	--7.3	11.1
Sesamum	0.65	618	'600	700	-2.9	16.7
Rapeseed & Mustard	2.41	5884	6340	6200	7.7	-2.2
Linseed	0.45	325	310	350	-4.5	12.9
Castorseed	0.19	850	790	850	-7.0	7.6
Safflower	0.32	419	400	450	4.5	12.5
Nigerseed	0.13	196	190	220	-3.1	15.8
Sunflower	0.10	1204	1350	1380	12.1	2.2
Soyabean	0.25	3666	4990	4700	36.1	-5.8
Coconut : mil nuts	1.83	12200	12000	12500	-1.6	4.2
Cottonseed	0.71	4117	4451	4760	8.1	7.0
Cotton (bales)	4.37	12109	13090	14000	8.1	7.0
Jute (bales)	0.55	8274	7740	8000	-6.4	3.4
Mesta (bales)	0.14	1177	1160	1200	-1.4	3.4
Sannhemp	0.03	42	43	43	2.4	0.0
Ginger dry	0.11	168	170	180	1.2	5.9
Pepper black	0.10	55	55	55	0.0	0.0
Chillies Dry	1.06	750	760	775	1.3	2.0
Turmeric	0.18	375	400	425	6.7	6.3
Arecanut	0.56	260	265	265	1.9	0.0
Coriander	0.15	210	215	225	2.4	4.7
Cardamom	0.21	10	10	10	0.0	0.0
Garlic	0.22	390	395	400	1.3	1.3
Tea	1.46	744	747	760	0.4	1.7
Coffee	0.44	180	220	200	22.2	-9.1
Rubber	0.39	472	511	525	8.3	2.7
Potato	2.09	17942	19000	20000	5.9	5.3
Tapioca	0.63	5400	5500	5600	1.9	1.8
Sweet Potato	0.31	1400	1450	1500	3.6	3.4
Banana	0.97	6700	7000	7200	4.5	2.9
Cashewnuts	0.35	371	418	425	12.7	1.7
Onions	0.55	4058	4200	4500	3.5	7.1
Sugarcane	8.11	271229	280490	272000	3.4	-3.0
Tobacco	1.12	587	590	600	0.5	1.7
Guarseed	0.34	1000	1200	1500	20.0	25.0
Foodgrains	62.92	191,097	185,000	196,270	-3.3	6.2
Non-food grains	37.08				4.4	2.6
All Commodities	100.00				-0.2	4.7

Source : Centre for Monitoring Indian Economy, Monthly Review, Sep.96

Rice Bran Potential and Availability

(Lakh Tonnes)

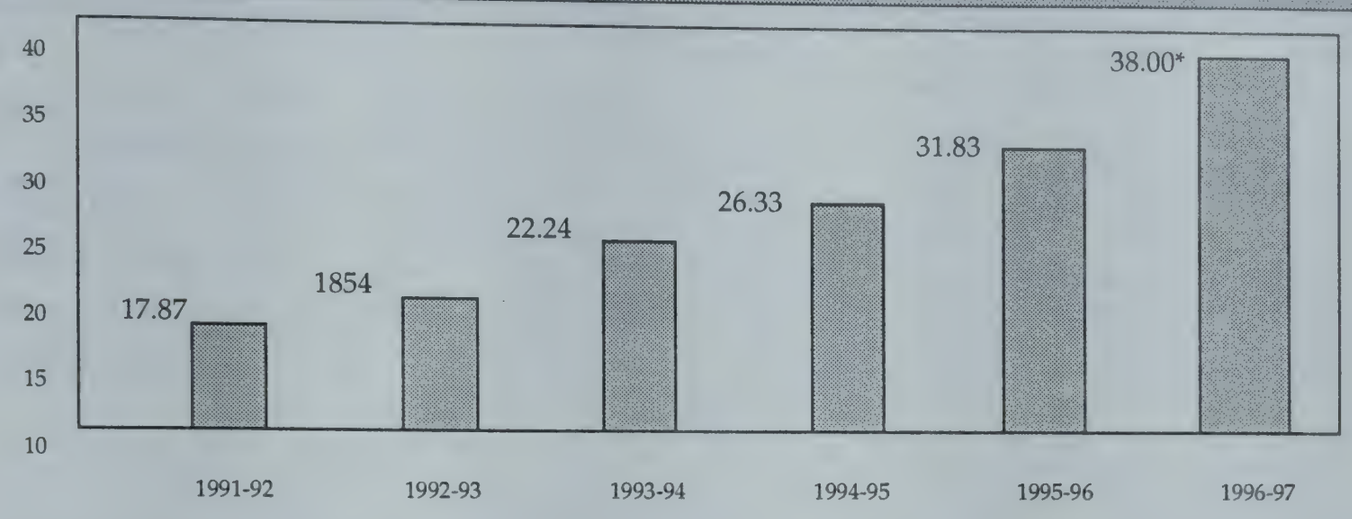
Items	1995-96 (Est)	1994-95	1993-94	1992-93	1991-92
Paddy Production (Est)	1200	1217	1205	1094	1121
Rice Production	800	811	803	729	747
Total Rice Bran Potential (7.5% of rice)	60.0	61.0	60.0	55.0	56.0
Actual Rice Bran Processing	32.0	31.7	30.3	31.0	28.5
% of Processing to Total Potential	53%	52%	51%	56%	51%
Rice Bran Oil Potential (15% recovery)	9.0	9.1	9.0	8.3	8.4
Actual Production of Rice Bran Oil	4.8	4.6	4.4	4.5	4.0

Turmeric Production

Producing Regions	1994-95 Final Estimates Bags	M.T.	1995-96 Final Estimates Bags	M.T.
Sangli, Wai, Barshi (Maharashtra) (1Bag=90Kgs)	2,25,000	20,250	1,50,000	13,500
Nanded (Maharashtra)(1Bag=90Kgs)	75,000	6,750	50,000	4,500
Nizamabad (Andhra)(1Bag=70Kgs)	13,00,000	91,000	10,00,000	70,000
Cuddapah (Andhra) (1Bag=70Kgs)	2,00,000	14,000	1,00,000	7,000
Duggirala (Andhra) (1Bag=70Kgs)	3,50,000	26,250	2,50,000	18,750
Warangal (Andhra) (1Bag=70Kgs)	3,50,000	24,500	2,50,000	17,500
Erode (Tamilnadu) (1Bag=65Kgs)	11,00,000	71,500	9,00,000	58,500
Others	2,00,000	14,000	2,00,000	14,000
Total	**38,00,000**	**2,68,250**	**29,00,000**	**2,03,750**

Source : The Spices & Oilseeds Exchange Ltd., Sangli

INDIA'S EXPORTS



Figures in $ billion

* Projection

Export of Chillies

(Qty. in Tonnes, Value in Rs. /Lacs)

	1991-92		1992-93		1993-94		1994-95		1995-96	
	Qty.	Value	Qty.	Value	Qty.	Value	Qty.	Value	Qty.	Value
Chillies dry	28905.51	8109.59	12930.58	5650.91	22980.00	5243.62	12813.84	3579.85	43878.04	14873.58
Chillies seed	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	114.00	28.34
Chillies Fresh/Child	100.66	7.79	123.51	14.06	293.28	40.96	116.90	16.86	95.70	9.16
Chillies Powder	3585.17	824.90	3973.60	1170.00	7407.99	1899.60	7102.06	2096.12	11930.58	4487.92
Capsicum Genus	0.00	0.00	0.00	0.00	46.66	19.02	34.90	12.35	10.67	3.74
Other Pimenta	11.31	6.19	10.24	2.13	47.70	10.37	28.66	6.44	44.00	12.04
Total	**32602.65**	**8948.47**	**17037.93**	**6837.10**	**30775.63**	**7213.57**	**20096.36**	**5711.62**	**56072.99**	**19414.78**

Source : DGCI &S, Calcutta

Area & Production of Chillies in India

Year	Area (Hectares)	Production (Tonnes)	Year	Area (Hectares)	Production (Tonnes)
1981-82	806.400	514.700	1988-89	805.000	680.400
1982-83	818.000	538.900	1989-90	907.800	801.500
1983-84	818.100	566.500	1990-91	816.200	719.000
1984-85	794.800	630.500	1991-92	846.300	817.500
1985-86	904.100	877.400	1992-93	962.100	862.100
1986-87	834.600	629.200	1993-94	930.800	800.100
1987-88	743.200	579.800	1994-95	810.400	747.900

Source : Directorate of Economics & Statistics, Ministry of Agriculture, New Delhi.

Export of Rice Bran Extraction

Year	Quantity (Tonnes)	F.O.B. (Crores)	Unit Value (Rs./Tonnes)
1990	581295	66.83	1149
1991	460180	62.51	1358
1992	406326	78.56	1933
1993	481342	88.03	1828
1994	391806	71.66	1829
1995	261634	60.02	2294

Vanaspati Production

	Bulk	Small Packs	Defence	Total
1990-91	617621	191189	7826	816636
1991-92	619888	218550	18982	857420
1992-93	637223	252145	1338	890706
1993-94	649409	288021	NA	937430
1994-95	645626	299480	NA	945106
1995-96 *(estimated)*	NA	NA	NA	995000 *(Tonnes)*

How much you should eat

The restriction of calories can be 550 per day to lose half kg per week or 100 calories per day to lose one kg per week. The latter restriction should be undertaken only on the advice of a doctor.

1800 calories for men is conveniently divided into three meals and one snack. A midmorning or late night snack, may also be included provided the calories are adjusted with the nearest main meal.

Breakfast	400 cals	Breakfast	400 cals
Lunch	500 cals	Midmorning	100 cals
Tea	350 cals OR	Lunch	500 cals
Dinner	550 cals	Tea	300 cals
		Dinner	500 cals

For women, the 1400 cal diet prescription may be similarly divided as follows :

Breakfast	350 cals	Breakfast	300 cals
Lunch	400 cals	Lunch	350 cals
Tea	250 cals OR	Tea	250 cals
Dinner	400 cals	Dinner	400 cals

The diet prescriptions mentioned above have to be further individualized from person to person. It is important to remember that these values will change according to the amount of fat used in cooking and also the use of ingredients such as coconut, nuts and cream.

Calorie Burner

Types of Exercise	Calorie burnt in 1 hour	Hours required to lose 1 kilo
WALKING	256 Cal.	30 Hrs
ACTIVE CYCLING	481 Cal.	16 Hrs
SWIMMING	641 Cal.	12 Hrs
RUNNING	770 Cal.	10 Hrs
WALKING UPSTAIRS	900 Cal.	8.5 Hrs

RAW MATERIALS

Switch-over to Modern Plantation Technology Imperative

The productivity of raw cashewnuts varies from state to state. The national average is 658 kgs per hectare which is far less than the achievable level of 1,000 kgs per hectare. This level of 1,000 kgs per hectare is achieved if proper and latest techniques are used. The National Research Centre for Cashew (under the Indian Council of Agricultural Research) at Puttur in Karnataka, and the agricultural universities in the southern states have developed very good planting materials and advance farming technology. There are more than 25 high yielding and early bearing varieties of cashew developed by the NRCC and agricultural universities, but these have not been widely propagated.

During the Seventh Plan only Rs five crore was utilised for cashew production development. The 8th Plan allocation for cashew development is Rs 48 crore, targeting a production level of six lakh tonnes by 2000 AD. However, our requirements of raw cashewnuts would be about 10 lakh tonnes to yield about 2.50 lakh tonnes of cashew kernels to make available 1.50 lakh tonnes of kernels for export and one lakh tonnes for domestic consumption. If the domestic production of raw cashewnuts is not increased to 10 lakh tonnes by 2000 AD we may have to continue to depend on imports for meeting our export and domestic requirements of cashew kernels. Availability from imported sources is likely to suffer drastically in the years to come, as more and more producing countries are resorting to processing and exporting of kernels.

Cashew is essentially an agricultural commodity and the production is subject to the vagaries of nature. Hence in order to ensure steady supply of raw cashewnuts domestically, a minimum production level has to be ensured. This can be achieved only by extension of cultivation to different geographical regions, utilisation of varieties suitable for different agroclimatic conditions and also varieties resistant to vagaries of nature, pests, diseases, etc.

Pulses Production Target Raised for 1996-97

The Planning Commission has fixed an ambitious production target of 17 million tonnes (MT) for pulses during 1996-97 against 15.5 MT fixed for 1995-96. The government had maintained a target of 15.5 MT for two consecutive years. However, actual production in 1995-96 touched a level of 14.8 million tones against 14.1 MT in 1994-95.

Production level of pulses for the current kharif season is barely expected to touch 5.9 MT against the target of seven MT. The shortage of 1.1 MT, according to importers, would be met with large imports that are scheduled to arrive till the end of December 1996 and beginning of the new year. In the kharif season, toor is the most important pulse followed by urad, desi chana and masoor. Main producing states for pulses are Maharashtra, Gujarat and Madhya Pradesh. Market experts opine, that harvest of new crop toor is yet a month away, however, prices of toor in local market during October 1996 have already been indicating a decline. Industry sources reveal that approximately 74,000-75,000 tonnes of pulses are scheduled to arrive by the end of the calendar year. The scheduled imports comprise approximately 17,000 tonnes of Australian gram, 7,000 tonnes of chick peas, 7,000 tonnes of black matpe, 8,000 tonnes of toor, 25,000 tonnes of green peas and 10,000-12,000 tonnes of yellow peas.

Pulses production in India is still facing a number of constraints. Many factors are attributed to the low production of pulses, like diseases and monsoons. Methods to accelerate pulses production is essential.

AFST(I) NEWS

Annual Convention and Colloquium on 'Food Safety and Quality'

The Association of Food Scientists & Technologists (India), AFST(I) organized its Annual Convention and a Colloquium on "Food Safety & Quality" which was followed by the Annual General Body meeting on 7th September 1996 at IFTTC Auditorium, Central Food Technological Research Institute (CFTRI), Mysore. Dr. Anjana Murthy, Vice Chancellor, Karnataka Open University, Mysore was the Chief Guest at the Convention. Dr. V. Prakash, Director, CFTRI presided over the function. The function started with a melodious invocation by Shri. R. Shivaram, followed by a welcome address by the President, AFST(I) Dr. (Mrs.) Rugmini Sankaran. In her welcome address, she stressed on the role AFST(I) has played in the advancement of all aspects of Food Science and Technology and in the dissemination of information on the current developments in the area. Dr. Anjana Murthy felt that the country could increase its foreign exchange earnings if the safety and quality of the products are ensured and called upon food scientists and technologists to strive towards this. Dr. V. Prakash in his presidential address said that the job of defining "food safety" had become difficult in the present context and it was the responsibility of food scientists and technologists to make efforts to ensure compliance of food products to safety standards. He felt that the industry should use this national body as its mouth piece for its problems and grievances.

The following annual AFST(I) Awards were presented to distinguished scientists/students in recognition of their contribution;

I. AFST(I) Fellow Award

Dr. Anantharaman S. Aiyar, Bangalore

Prof. Jiwan S. Sidhu, Kuwait Institute for Scientific Research, Kuwait

Prof. (Mrs.) Pushpa R. Kulkarni, UDCT, Mumbai

Dr. J.S. Pruthi, UNDP Consultant/Advisor, New Delhi

Dr. P. Narasimham, Scientist, CFTRI, Mysore

II. Laljee Godhoo Smarak Nidhi Award

Dr. B. R. Thakur, Defence Food Research Laboratory, Mysore

III. Young Scientist Award

Ms. Rekha Satischandra Singhal, Thane

IV. Best Student Award

Ms. Sonia Dang, Haryana Agricultural University, Hissar.

V. Best Paper Award

Prof. H. Das and Mr. K.Ten Hove for their paper on "Evaluation on Yield, Texture and Cooking Time of *Rasogolla*", published in Vol.32, No.2, 1995, pp 109-114, of the Journal of Food Science and Technology.

Shri. C.P. Natarajan and Dr. S. Ranganna, the editors who took pains to bring out the Proceedings of IFCON-93 were felicitated at the Convention.

Dr. M. Mohan Ram, Director, National Institute of Nutrition, Hyderabad, spoke on the health implications vis-a-vis food quality and safety. He stressed the need for reappraisal of management of food quality control system, which is being implemented by several agencies of different ministries of Union and State Governments. He felt that food of adequate quality and safety is required for proper nutrition, which in turn, is essential for sound health of the people. Dr. P. R. Krishnaswamy, Manipal Medical Centre, Bangalore spoke on various aspects of 'Food Safety'. Mr. C.T. Murthy, Hon. Treasurer, AFST(I) presented the financial statement. The function ended with a vote of thanks by the Executive Secretary Mr. P.C.S. Nambiar.

Annual General Body Meeting

The 31st Annual General Body Meeting (AGBM) of the Association was held on 7th September 1996 at 3.30 p.m. in the IFTTC Auditorium, Mysore.

Dr. (Mrs.) Rugmini Sankaran, President, AFST(I) welcomed the members present.

In the welcome address, she reiterated that AFST(I) should pursue the efforts in a more accelerated way, to get representation in the scientific policy making bodies of the Government of India. She mentioned that it was a good augury that the Association's representative was invited to participate in the Core Committee Meeting of Directorate General of Health Services on 'Food Colours' in New Delhi this year.

Mr. P.C.S. Nambiar, Hony. Executive Secretary read out the reports of the last AGBM and SGBM. Minutes of the AGBM were approved as proposed by Dr. T.S. Satyanarayana Rao and seconded by Mr. P.S. Balakrishna. Minutes of the SGBM were approved as proposed by Dr. S.R. Padwal Desai and seconded by Dr. R.R. Mohite. Since the report was circulated to members prior to the present AGBM, it was opined by the members that only the important points need be highlighted. As a major salient point, the Secretary informed that the award money for various awards instituted by the AFST(I) has been enhanced from 1996 onwards. Best Feature Article Award for Feature Articles published in Indian Food Industry has been instituted from the calendar year 1996. A similar award is already existing for the best paper published in Journal of Food Science and Technology. He also informed that M/s. Laljee Godhoo have agreed to enhance the award money from 1996 onwards. After an indepth discussion, the Secretary's report was approved by the members. The Treasurer's report along with the audited statement of accounts and budget estimate, which was circulated already, was also approved by the General Body.

Dr. T.S. Satyanarayana Rao and Dr. A.M. Nanjundaswamy proposed 2 amendments to the existing constitution of AFST(I):

1. According to Clause 3.4.4 of the constitution of AFST(I), the Editor-in-Chief, Journal of Food Science and Technology is one of the members of the Central Executive Committee. In a similar way, the Chief Editor, Indian Food Industry should also be treated as one of the members of the Central Executive Committee.

2. No person can hold two positions in the Central Executive Committee.

The above amendments were approved by the General Body.

Mr. Rajesh S Matche proposed that Mr. A.K. Krishnamoorthy may continue as Auditor for the coming year also. The General Body agreed to this proposal.

Results of the elections conducted as per the constitution, with Dr. Vidyasagar as the Returning Officer were announced amidst protests from members on a point raised by Dr. T.S. Satyanarayana Rao.

The Secretary Mr. P.C.S. Nambiar announced the results of the election for the year 1996-97.

President-Designate :

Dr. S.S. Arya

Vice-President (H.Q.) :

Mrs. Sreemathi Hariprasad

Vice-Presidents (Chapters):

Dr. H.R. Adhikari, Mumbai

Prof. R.K. Mukherjee, Kharagpur

Prof. D.K. Gupta, Pantnagar

Dr. P.I. Geeverghese, Thrissur

Joint Secretary :

Mr. Rajesh S. Matche

Hon. Treasurer :

Mr. Baldev Raj

In addition to the above elected office bearers, President : Dr. C.L. Nagarsekar, Immediate Past President: Dr. (Mrs.) Rugmini Sankaran, Hony. Executive Secretary : Dr. M.S. Krishnaprakash, Immediate Past Secretary: Mr. P.C.S. Nambiar, Editor-in-Chief, JFST : Dr. B.K. Lonsane, Chief Editor, IFI will form the members of the Central Executive Committee for the year 1996-97.

The outgoing President Dr.(Mrs.) Rugmini Sankaran then inducted Dr. C.L. Nagarsekar as the new President and also introduced the other elected members and requested Dr. Nagarsekar to conduct further proceedings.

After taking over as President, AFST(I), Dr. C.L. Nagarsekar placed on record the valuable services of Past-President and other CEC members. He thanked the members for electing him as the President. He stressed the point that AFST(I) should enrol more and more members. He called for the co-operation of all the members to take the Association to still greater heights. Referring to the participation of AFST(I) in the DGHS Committee Meeting on Food Colours, he said that it was a good beginning and the voices of scientists and technologists should continue to be heard in the policy making bodies of the Government of India. He felt that members from surrounding places of a chapter should be drawn to work unitedly for the benefit of

the Association. He promised to co-ordinate this task.

Dr. A.M. Nanjundaswamy mentioned that AFST(I) could think of having its own building either outside the CFTRI campus or acquire a site in or near the campus to construct its own office premises with all facilities, since a substantial amount has already been earmarked for this purpose.

Dr. R.R. Mohite, while congratulating the newly elected President, wanted to know the status regarding the preparation of a Compendium of AFST(I) members. The Secretary explained that the same could not be brought out as envisaged, because a majority of members, who had 10 years of continuous membership of the Association had not responded to the Headquarters' request to send the details of their expertise in time. However, members' list will be brought out every year, he said. Mr. P.S. Balakrishna suggested that a Database of the expertise of all the members should be kept in AFST(I) office for ready reference.

Dr. S.R. Padwal Desai congratulated the incoming office bearers and expressed the view that the term of office bearers could be for 2 years so that they could coordinate the activities of the Association by working more efficiently. Mr. N. Keshava suggested that a copy of the constitution of AFST(I) may be supplied to the office-bearers so that they will have a clear knowledge about the Clauses. Ms. Sonia Dang, Best Student Awardee for the year 1995 suggested that TA/DA may be given to the awardees coming from distant places to receive the award.

Dr. P. Narasimham suggested that a 10 - Year Action Plan may be formulated, covering all aspects, which could go a long way in achieving the objectives of the Association.

The AGBM ended with a vote of thanks to the Chair and all the members.

AFST(I) is pleased to inform that

Dr. RICHARD JOSEPH has taken over as
Chief Editor of 'INDIAN FOOD INDUSTRY'.
He is presently Head of Food Microbiology Department of CFTRI, Mysore.

Nominations Invited for Fellows of AFST(I) for 1996

The AFST(I) has pleasure in inviting nominations from persons to be conferred as "Fellow of Association of Food Scientists and Technologists (India)". The title (FAFST) is conferred to honour those who have contributed significantly to the progress of Food Science and Technology.

General

1. The awardee will be called as Fellow of Association of Food Scientists and Technologists (India) and an abbreviated form will be termed as FAFST.

2. The total number of Fellows of the Association will not exceed 5% of total membership including regular and life members of the Association in any given year or 100, whichever is lower.

The title of Fellows has so far been awarded to 41 AFST(I) members and 6 non-members who have contributed to the progress of Food Science and Technology.

Eligibility

1. The aim is to honour persons of outstanding merit who have contributed significantly in the field of Food Science and Technology including R & D Product/ Project Development, Industry, Transfer of Technology and Marketing. The merit of contribution should be the main criterion.

2. Among the Fellows to be nominated every year, 70% will be from AFST(I) and remaining 30% may be from non-members who have contributed significantly for the development of Food Science and Technology.

Nominations

1. The nomination for Fellow should be proposed by five AFST(I) members of good standing for a minimum of 5 years or by 2 Fellows of the Association. This is applicable to AFST(I) members as well as non-members.

2. Any regular or life member of AFST(I), who has been continuously a member of the Association can sponsor the nomination for only one Fellow in a particular year.

3. The nomination shall be accompanied by acceptance of the person proposed.

4. The nomination shall be in the format given. A brief biodata of the nominee highlighting the Scientific or Technological achievements in the area of Food Science and Technology, supported by a list of publications not exceeding 10 important research papers or other supporting documents not exceeding 20 pages must accompany the nominations.

5. Central Executive Committee Members of AFST(I) are not eligible to be nominated as Fellows.

6. The nomination duly proposed and accepted by the nominee shall be sent to the Hon. Executive Secretary, AFST(I) by **31st March 1997.**

Selection of Fellows

The nominations received will be placed before an Expert Committee appointed by the CEC for suitable recommendations to CEC each year. CEC by majority decision will finalise the names of Fellows for each year. **The decision of CEC in this matter will be final.**

Privileges of a Fellow

The Fellow shall be entitled to the following rights :

1. The awardee will be entitled to add FAFST after his name as short title.

2. To be present and vote at all general body meetings.

3. To propose and recommend the candidates for Fellow of the Association.

4. To receive *gratis* copies of one of the publications of AFST(I).

5. To fill any office of the AFST(I) when duly elected.

6. To be nominated to any committee of AFST(I).

7. To offer papers and communications to be presented before the meeting of the Association.

8. The title will remain for life time of the member.

Cessation of Fellow

1. Any Fellow may withdraw his/her title of the Association by signifying his/her wish to do so by a letter addressed to the Hony. Executive Secretary, AFST(I), which will be placed before the CEC for acceptance.

2. If the Association comes to know of any activity prejudicial to the interest and well being of the Association, the CEC will have the right to withdraw the title.

Conferring as Fellows

The Fellow will be conferred with a Citation at the time of AGBM or at any other suitable function of the Association.

The Association may invite some Fellows nominated each year to deliver special lectures in the area of their specialisation either at the AGBM or any other function arranged by the AFST(I).

The nominations duly filled up as per the format given are to be sent by Registered post to the Hony. Executive Secretary, AFST(I), CFTRI Campus, Mysore - 570 013 so as to reach him on or before **31st March 1997.**

The envelope containing the nomination along with the biodata and contributions (6 copies) should be superscribed **'Nomination for Fellow AFST(I)'.**

M. S. Krishnaprakash
Hon. Executive Secretary

Nomination Form for Fellows of AFST(I)

We, the following members of AFST(I) wish to propose

Full name and academic distinction

FULL NAME

DATE OF BIRTH

AREAS OF SPECIALIZATION

ACADEMIC QUALIFICATIONS

for election as Fellow of AFST(I). We append below the statement of his/her claims for election as Fellow and certify that in our opinion he/she is fully qualified for that distinction. We also certify that he/she has been informed of the obligations attached to the fellowship of the AFST(I) and is aggreeable to abide by them, if elected.

Statement of the proposer (not to exceed 100 words) setting out the discovery, invention or other contribution to newer or process/products or the industrial development of the knowledge made by the nominee.

.....

Seconder's name & signature

Date :

Station :

Proposer's name & signature

Date:

Station :

(Signature of supporters from personal/general knowledge)

(1) (2) (3)

I agree for the above nomination

(Name & Signature)

.....

Note :

(1) Six copies of the candidate's bio-data and list of important scientific publications not exceeding 10 pages and one set of reprints or supporting documents not exceeding 20 pages shall be attached to this form.

(2) Additional information that would be of assistance in considering the nomination may be supplied on separate sheet.

(3) Last date for receipt of nomination at the office is **31st March 1997.**

Nominations for AFST (I) Awards for 1996

Nominations for the following awards of the AFST(I) for the year 1996 are invited. All nominations should be sent by Registered Post, so as to reach Honorary Executive Secretary, Association of Food Scientists and Technologists (India), CFTRI Campus, Mysore - 570 013, **before 31st March 1997.**

Prof. V. Subrahmanyan Industrial Achievement Award

The guidelines for the award are :

(i) Only Indian nationals with outstanding achievement in the field of Food Science and Technology will be considered for the award.

(ii) The nominee should have contributed significantly to the enrichment of Food Science and Technology, and the development of agro-based food and allied industries in India.

(iii) The nominations duly proposed by a member of the Association must be accompanied by the biodata of the nominee, highlighting the work done by him/her for which he/she is to be considered for the award.

(iv) The awardee will be selected by an expert panel constituted by the Central Executive Committee of the Association.

(v) Central Executive Committee Members of AFST(I) are not eligible to apply for the award during their tenure.

The envelope containing the nominations, along with bio-data and contributions (six copies) should be superscribed **"Nomination for Prof. V.Subrahmanyan Industrial Achievement Award - 1996."**

Laljee Godhoo Smarak Nidhi Award

The guidelines for the award are :

(i) The R & D group/person eligible for the award should have contributed significantly in the area of Food Science and Technology in recent years, with a good standing in his/her field of specialization.

(ii) The nominee(s) should be duly sponsored by the Head of the respective Scientific Institution and the application for this award should highlight complete details of the contributions made by the nominees and their significance.

(iii) The nomination duly proposed by a Member of the Association must be accompanied by the bio-data of the nominee.

(iv) Central Executive Committee Members of AFST(I) are not eligible to apply for the award during their tenure.

The envelope containing the nominations along with bio-data and contributions (six copies) should be superscribed **"Nomination for Laljee Godhoo Smarak Nidhi Award 1996.."**

Best Student Award

The award is to be given to a student having a distinguished academic record and undergoing the final year course in Food Science and Technology in any recognised University in India. The aim of the award is to recognize the best talent in the field and to encourage excellence amongst the student community.

The guidelines for the award are :

(i) The applicant must be an India national.

(ii) He/she must be a student of one of the following courses :

(a) M.Sc. (Food Sciences /Food Technology)

(b) B.Tech., B.Sc. (Tech), B.Sc. (Chem. Tech) with Food Technology specialization.

(iii) He/she should not have completed 25 years of age on 31st December 1996.

Heads of the Department of Food Science and Technology in various Universities may sponsor the name of one student from each institution, supported by the candidate's bio-data, details starting from high school onwards, including date of birth and post-graduate performance to date (six copies).

The envelope containing the nomination should be superscribed **"Nomination for Best Student Award 1996."**

Young Scientist Award

This award is aimed at stimulating distinguished scientific and technological research in the field of Food Science and Technology amongst young scientists in their early life.

The guidelines for the award are :

(1) The candidate should furnish evidence of either.

(a) Original scientific research of high quality, primarily by way of published research papers and (especially if the papers are under joint authorship) the candidate's own contribution to the work.

OR

(b) Technological contributions of a high order, as reflected by accomplishments in process design etc., substantiated with documentary evidence.

The application along with details of contributions and bio-data (six copies) may be sent by registered post with the envelope superscribed **"Nomination for Young Scientist Award 1996.**

Best Paper Award and Best Feature Article Award

These awards are to be given by the AFST(I) Educational and Publication Trust to the author(s), who have contributed the best paper to the Journal of Food Science and Technology and best feature article to Indian Food Industry published in 1996. A panel of experts, constituted by the Central Executive Committee, will scrutinize the issue and select the best paper / feature article for the award.

M.S. Krishnaprakash

Hon. Executive Secretary

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Signature

ASSOCIATION OF FOOD SCIENTISTS AND TECHNOLOGISTS (INDIA) MYSORE - 570 013

Telephone : 421747, 515557 Telex : 0846-241 FTRI IN, Cable : FOODSEARCH, MYSORE. Fax : 421747, 27697, 24475 (Country code : 91, Mysore code : 821); E-mail afst @ nicfos. ernet. in

* Affiliated to the Institute of Food Technologists, Chicago, Illinois, U.S.A.
* The Association is a professional and educational organization of Food Scientists and Technologists, with its headquarters at Mysore.
* The chapters of the Association the association are located at Bangalore, Bhopal, Bombay, Calcutta, Delhi, Hisar, Hyderabad, Jabalpur, Jaipur, Jammu, Kanpur, Karnal, Kharagpur, Ludhiana, Madras, Manipur, Nagpur, Pantnagar, Parbhani, Pune and Thiruvananthapuram.

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* Advancement of all the aspects of Science and Technology relating to production, processing and distribution of food, with the ultimate objective to serve humanity through better food.
* Promotion of research, development and training in the Science, Technology and Engineering of Food.
* To provide a forum for exchange, discussion and dissemination of knowledge and current developments, especially among Food Scientists and Technologists as well as the Public and Society at large.

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* Publication of 'Journal of Food Science and Technology' (bi- monthly) and 'Indian Food Industry' (bi-monthly),
* Holding symposia/conventions on different aspects of Food Science, Technology and Engineering
* Arranging Lectures and Seminars for the benefit of Members and the Public.

Membership :

* Membership is open to graduates and diploma holders in Food Science, Technology and Engineering as well as to those engaged in these professional activities.
* Types of membership include Life Member, Life Member (Resident Abroad), Corporate Members, Full Member, Member (Resident Abroad), Affiliate Member, Student Member and Student Member (Abroad).
* Each member will receive a free copy of the 'Journal of Food Science and Technology' or 'Indian Food Industry,' as per the option exercised.

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